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RECORD, CASE No. 13,818.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1892.

TERM No., 217.

JOHN T. UNDERWOOD AND JOHN T. UNDERWOOD AND HANNAH E. UNDERWOOD, EXECUTORS OF FREDERICK W. UNDERWOOD, DECEASED, APPELLANTS,

vs.

HENRY GERBER AND ANTON ANDREAS.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF NEW YORK.

FILED OCTOBER 18, 1889.

CIRCUIT COURT OF THE UNITED STATES,

EASTERN DISTRICT OF NEW YORK.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD AGAINST HENRY GERBER and ANTON ANDREAS.	In Equity.

You will please take notice that the taxation of costs has been perfected in this suit, and that the costs as retaxed by the Clerk of the Court amount to the sum of $542.31.

This notice is served upon you pursuant to the terms of an order made herein by his Honor Judge Lacombe on the 20th day of March, 1889.

New York, April 13, 1889.

Yours, &c.,
BRIESEN, STEELE & KNAUTH,
Solicitors for Defendants.
A. V. BRIESEN,
Of Counsel.

To JAMES A. HUDSON, Esq.,
Solicitor for Complainants.

(Endorsed)—U. S. Circuit Court, East. Dist. of N. Y.—J. T. Underwood *et al. vs.* Henry Gerber *et al.*—Notice of Perfected Taxation of Costs.—Briesen, Steele & Knauth, Defts.' Solicitors, 229 Broadway, New York.—Due service of a copy of the within notice is hereby admitted.—N. Y., April 13, 1889.—James A. Hudson, Complts.' Sol.

RECORD, CASE No. 13,818.

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JOHN T. UNDERWOOD AND JOHN T. UNDERWOOD AND HANNAH E. UNDERWOOD, EXECUTORS OF FREDERICK W. UNDERWOOD, DECEASED, APPELLANTS,

vs.

HENRY GERBER AND ANTON ANDREAS.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF NEW YORK.

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1 The President of the United States of America to Henry Gerber and Anton Andrews, Greeting:

[L. S.] You are hereby commanded that you and each of you personally appear before the judge of the circuit court of the United States of America for the Eastern district of New York, in equity, on the first Monday in November, A. D. 1887, wheresoever the court shall then be, to answer a bill of complaint exhibited against you in the said court by John T. Underwood and Frederick W. Underwood, and to do further and receive what the said court shall consider in that behalf, and this you are not to omit under the penalty on you and each of you of two hundred and fifty dollars.

Witness the Hon. Morrison R. Waite, Chief Justice of the Supreme Court of the United States, at the city of Brooklyn, on the 13th day of October, in the year of our Lord one thousand eight hundred and eighty-seven.

B. LINCOLN BENEDICT, *Clerk.*
JAMES A. HUDSON,
Complainant's Sol'r, Temple Court, N. Y. City.

The defendants are required to enter an appearance in the above cause in the clerk's office of the court on or before the first Monday of November, 1887, or the bill will be taken *pro confesso* against them.

B. LINCOLN BENEDICT, *Clerk.*
JAMES A. HUDSON,
Complainant's Solicitor.

2 The within subpœna was personally served on Henry Gerber on the 13th day of October, 1887, and on Anton Andrews on the 14th day of October, 1887, in the city of Brooklyn by delivering to and leaving with them severally copies of said subpœna, and at the same time and place exhibiting to them the within original.

Dated October 17th, 1887.

CHARLES M. STAFFORD,
United States Marshal, E. D. N. Y.,
By THOS. FOGARTY, *Deputy.*

Endorsed: Subpœna *ad respondendum.* Filed and entered Oct. 18th, 1887.

In the Circuit Court of the United States for the Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
versus
HENRY GERBER and ANTON ANDREWS. } In Equity.

Bill of Complaint.

To the honorable the judges of the circuit court of the United States for the eastern district of New York:

John T. Underwood and Frederick W. Underwood, both residents of Brooklyn, Kings county, New York, bring this their bill of complaint against Henry Gerber and Anton Andrews, both of Brooklyn, Kings county, New York.

And thereupon your orators complain and say:

1. That they, being citizens of the United States and being the original, first, and joint inventors of certain new and useful improvements in reproducing the surfaces for type-writing and manifolding for the same purposes as those commonly known as "carbon" papers, fully described in the letters patent issued therefor hereinafter mentioned, and that had not been known or used by others in this country, and not patented or described in any printed publication in this or any foreign country before their invention thereof, and that had not been in public use or on sale in the United States for more than two years prior to the date of their application for letters patent therefor, did make due application on March 22d, 1886, for letters patent of the United States therefor, and, having fully and in all respects complied with all the requirements of the law in that behalf, did obtain letters patent of the United States therefor, issued in due form of law in the name of the United States of America, and under the seal of the Patent Office of the United States, and duly signed and countersigned, bearing date August 24, 1886, and numbered 348,073, and thereby was granted and secured unto your orators, their heirs and assigns, for the term of seventeen years from said 24th day of August, 1886, the full and exclusive right and liberty of making, using, and vending throughout the United States and territories thereof the said improvements therein specified and claimed, as in and by said letters patent or a certified copy thereof here in court to be produced will more fully appear, and thereby your orators became and were and still continue to be the exclusive owners of all the rights and privileges granted and secured or intended to be so in and by said letters patent.

2. And your orators further show unto honors that the said rights and privileges so secured to them are of great value, and that since the issue of said letters patent, as well as while the application
4 therefor was pending in the Patent Office, your orators have invested large sums of money and have been to great trouble

in and about the said invention in making the same profitable to themselves and useful to the public; that the public generally have acquiesced in the rights of your orators as secured to them by the said letters patent; that large quantities of goods have been made by your orators in accordance with said invention and have been sold by them to the great advantage of the public and with profit to themselves, and your orators believe that they will realize large gains and profits therefrom if infringements by the defendants shall be prevented.

3. And your orators further show on information and belief that the defendants, well knowing the premises and the rights secured to your orators as aforesaid, but contriving to injure your orators and deprive them of the benefits and advantages which would otherwise accrue to them from said invention after the issuing of said letters patent 348,073 and before the commencement of this suit within the eastern district of New York and elsewhere within the United States without the license or allowance of your orators and against their known will and desire and in violation of their exclusive rights, unlawfully, wrongfully, and injuriously and in defiance of the rights of your orators and with intent to derive profits to themselves and to deprive your orators of their profits and rights and in infringement of the said letters patent did make and use and sell to others to be used and sold sheets of material or fabric made in accordance with said letters patent and embodying and containing essentially and substantially the invention claimed and covered thereby.

4. And your orators further show that they are ignorant of and cannot state how much or what quantities of said sheets of paper or fabrics made and embodying the invention as aforesaid have been made and sold or used by the defendants, but they aver on information and belief that the defendants have made and sold and caused to be made and used and have put upon the market to — used and sold large quantities thereof, and that they have large quantities thereof yet on hand, which they threaten to put upon the market and sell, and that they have derived large profits from their said sales thereof, but to what amount your orators are ignorant and cannot set forth, and that your orators have been deprived of large sales and profits by reason of the aforesaid infringement of the defendants and have incurred large damage thereby.

5. And your orators further show that they fear and have reason to fear that unless the defendants are restrained by a writ of injunction issuing out of this honorable court they will continue to make, use, and sell large quantities of said patented goods and thereby will cause irreparable damage to your orator's aforesaid exclusive rights.

6. And your orators further show that they have caused notice to be given to said defendants of said infringements of the exclusive rights of your orators in the premises prior to the beginning of this suit and have requested and warned them to desist and refrain therefrom, but said defendants have disregarded said notice and re-

fused to desist from said infringements, and still continue to make, use, and sell the said patented goods in disregard of your orator's rights.

All which acts and doings of the defendants are contrary to equity and good conscience, and tend to the manifest injury of your orators, and have the effect to encourage others to venture to infringe said patent in disregard of your orator's rights.

Wherefore your orators pray that the said defendants, Henry Gerber and Anton Andrews, and each of them and their and each of their servants, agents, attorneys, and workmen may be restrained and enjoined, provisionally and perpetually, by the order and injunction of this honorable court from directly or indirectly making, constructing, using, vending, delivering, working, or putting
6 into practice, operation, or use or in anywise counterfeiting or imitating the said invention or any part thereof or sheet or sheets of material or fabric made in accordance therewith or like or similar to those which they, the said defendants, have heretofore made, and that the said defendants may be decreed to pay the profits unlawfully obtained by them by reason of the aforesaid infringements, and the damages thereby suffered by your orators, and the costs of this suit, and that the defendants may be decreed to deliver up to the complainants all infringing goods that they have on hand and all materials and apparatus in their possession with which such infringements have been committed or that are by them held for such purpose, and that your orators may have such further relief or such other relief as to this honorable court shall seem meet and as shall be agreeable to equity.

And forasmuch as your orators can have no adequate relief except in this court, to the end, therefore, that the said defendants may, if they can, show cause why your orators should not have the relief hereby prayed, may upon their several and corporal oaths and according to the best and uttermost of their knowledge, remembrance, information, and belief full, true, direct, and perfect answers make to the premises and to all the several matters hereinbefore stated and charged as fully and particularly as if severally and separately interrogated as to each and every of said matters and may be compelled to account for and pay over to your orators the profits by them acquired and the damages suffered by your orators from the infringement by them committed—

May it please your honors to grant unto your orators the writ of injunction, as well provisional as perpetual, issuing out of and under the seal of this honorable court commanding, enjoining, and restraining the said defendants, Henry Gerber and Anton Andrews, and each of them and their and each of their servants, agents, attorneys, and workmen as is hereinbefore in that behalf prayed.

7 And may it please your honors to grant unto your orators the writ of subpœna issuing out of and under the seal of this honorable court, directed to the said defendants, Henry Gerber and Anton Andrews, and each of them, commanding them by a certain

day and under a certain penalty to be and appear in this honorable court, then and there to answer the premises and to stand to and abide such order and decree as may be made against them.

And your orators will ever pray, &c.

JOHN T. UNDERWOOD.
FREDERICK W. UNDERWOOD.

JAMES A. HUDSON,
Solicitor and of Counsel for Complainants,
Temple Court, New York City.
ARTHUR S. BROWN, *Of Counsel.*

UNITED STATES OF AMERICA, *Southern District of New York,* } ss:

On this 13th day of October, 1887, before me personally appeared John T. Underwood and Frederick W. Underwood, the above-named complainants, who, being by me first duly sworn, did depose and say that they have read the foregoing bill of complaint subscribed by them and know the contents thereof, and that *that* the same is true of their own knowledge except as the matters therein stated to be alleged on information and belief, and as to those matters they believe it to be true, and that they verily believe themselves to be the true, original, and first and joint inventors of the invention described and claimed in the letters patent referred to in said bill of complaint.

JOHN T. UNDERWOOD.
FREDERICK W. UNDERWOOD.

Subscribed and sworn to before me this 13th day of October, 1887.

[SEAL.]

E. G. DUVALL, JR.,
Notary Public, N. Y. City.

Endorsed: Complaint. Filed Oct. 13, 1887.

8 United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS (Sued as Anton Andrews). } In Equity.

To the clerk U. S. circuit court, eastern district of New York:

Please take notice that I appear for the above-named defendants and respondents and request that you enter my appearance accordingly.

Dated October 31st, 1887.

Yours, &c.,

C. A. RUNKLE,
Sol. for Respon'ts & Def'ts.

Office and post-office address, Tribune building, N. Y. city.

Endorsed: Appearance. Filed Nov. 1, 1887.

9 United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
against
HENRY GERBER and ANTON ANDREAS, Sued as Anton Andrews. } In Equity.

The answer of the above-named respondents to the bill of complaint exhibited against them by John T. Underwood and Frederick W. Underwood, the complainants above named.

These defendants, now and at all times hereafter saving and reserving unto themselves all benefits and advantages of exception which can or may be had or taken to the manifold errors, uncertainties, imperfections, and insufficiencies in the bill of complaint contained, for answer thereunto or unto so much thereof as they are advised is or are material or necessary for them to make answer unto, answering, say as follows:

These respondents on information and belief admit that letters patent were granted to the complainants at the date mentioned and referred to in the bill of complaint and numbered 348,073,
10 but whether or not any or all of the requirements of the law in that behalf were complied with or whether the said letters patent were issued in due form of law, as alleged in the bill of complaint or otherwise, these respondents do not know and leave the complainants to prove the same as they may be best advised.

These respondents on information and belief deny that the complainants were the original, first, or joint inventors, or that either of said complainants was the original or first inventor of the alleged improvement referred to in the bill of complaint, or that the said complainants secured any exclusive rights or privileges by said letters patent.

And these respondents deny on information and belief that the said alleged improvement, invention, or discovery had not been known or used by others in this country before the alleged invention thereof mentioned in the bill of complaint, or that the same had not been in public use or on sale in the United States for more than two years prior to the date of the application of complainants for said letters patent.

These respondents, further answering, say that they have no information sufficient to form a belief as to whether or not the complainants now are the owners of said letters patent, and they leave said complainants to make such proof thereof as they may be advised.

They deny on information and belief that the public generally have acquiesced in the alleged rights of the complainants as alleged in the said bill of complaint or otherwise.

These respondents, further answering, say unto your honors that they have at no time infringed upon or violated the substance of any rights of the complainants herein.

These respondents, further show unto your honors on information and belief that for the purpose of deceiving the public the descrip-

tion and specification filed by the complainants in the Patent Office of the United States in order to procure said letters patent were made to show less than the whole truth in regard to said
11 alleged invention or discovery, and for like purpose and with like intent said complainants failed to file in said Patent Office on making the application for said letters patent or at any other time a written description of said alleged invention or discovery and of the manner and process of making, compounding, and using the same in such full, clear, concise, or exact terms as to enable a person skilled in the art or science to which it appertains or with which it is most nearly connected to make, compound, or use the same.

These respondents further show on information and belief that in view of the public and generally known state of the art at the time of the complainants' alleged invention or discovery the said letters patent were invalid for want of novelty.

These respondents further show unto your honors that prior to the alleged invention claimed by the complainants by said letters patent the same or the material parts of said invention or the whole of said invention was described in letters patent of the United States to John Underwood, of London, England, assignor to Waldo Maynard and Charles R. Thayer, of Boston, Massachusetts, dated March 31st, 1863, numbered 38036.

Also letters patent of the United States to Charles Cowan, dated May 4th, 1869, numbered 89738.

These respondents further show unto your honors on information and belief that the complainants are not the original or first inventors or discoverers of the invention or discovery claimed by them in said letters patent or of any material or substantial part of the thing patented, but the same had been invented, known, and used by John Underwood (now deceased), late of New Durham, Hudson Co., New Jersey.

These respondents further show on information and belief that prior to the alleged invention or discovery claimed by the complainants by said letters patent the same or material parts of said alleged invention or discovery or the whole thereof was known to and
12 used by John Underwood (now deceased), late of New Durham, Hudson Co., New Jersey.

Your respondents further show unto your honors on information and belief that the complainants surrep-itiously, unjustly, and unlawfully obtained the patent hereinbefore referred to for that which was invented by another, who was using reasonable diligence in adapting and perfecting the same.

These respondents further show on information and belief that the complainants surrep-itiously, unjustly, and improperly obtained the patent hereinbefore referred to for that which was, in fact, invented and discovered by John Underwood (now deceased), late of New Durham, Hudson Co., New Jersey, who was using reasonable diligence in adapting and perfecting the same.

These respondents further show unto your honors on information and belief that the said invention or discovery claimed by said

letters patent had been in public use and on sale in this country for more than two years prior to the application by the complainants for letters patent and had been abandoned to the public.

These respondents further show on information and belief that for more than two years prior to the complainants' application for letters patent the said alleged invention or discovery had been in public use and on sale in this country, among others, by—

John Underwood (now deceased), late of New Durham, Hudson Co., New Jersey, at New Jersey, New York city, New York, and elsewhere.

John Underwood & Co., at New Jersey, New York city, New York, and elsewhere.

John T. Underwood, of Brooklyn, N. Y., at New Jersey, New York city, New York, and elsewhere.

Frederick W. Underwood, of Brooklyn, N. Y., at New Jersey, New York city, New York, and elsewhere.

John T. Underwood & Co., of Brooklyn, N. Y., at New York city, New York, Chicago, Ill., and elsewhere.

13 E. Remington & Sons, of New York, at New York city, N. Y.

Wyckoff, Seamans & Benedict, of New York, at New York city, N. Y., and elsewhere.

J. W. Earle, of Philadelphia, at Philadelphia, Pa., and elsewhere.

The Misses Buttner, of New York, at New York city, N. Y.

Mess. Tucker & Co., of New York, at New York city, N. Y.

Writing Machine Supply Agency of New York, at New York city, N. Y.

Mess. Henry K. Brewer & Co., of New York, at New York city, N. Y.

Mrs. B. A. Rushton, of New York, at New York city, N. Y.

Miss Irene W. Holmes, of New York, at New York city, N. Y.

American Writing Machine Co. of Hartford, at Hartford, Conn., and New York.

W. Reid Gould, of New York, at New York city, N. Y.

And known and used by each of said persons.

And these respondents, further answering, say that the complainants are not entitled to an injunction or an account of profits or any other relief against these respondents, as prayed for in the bill of complaint; all which matters and things these respondents are ready and willing to aver, maintain, and prove as this honorable court shall direct, and humbly pray to be hence dismissed, with their reasonable costs and charges in this behalf most wrongfully sustained.

HENRY GERBER.
ANTON ANDREAS.

C. A. RUNKLE,
Solicitor for Respondents, Tribune Building, N. Y. City.

14 UNITED STATES OF AMERICA, } ss:
Eastern District of New York, }

Henry Gerber and Anton Andreas, being duly severally sworn, each for himself deposes and says that he is one of the respondents named in the foregoing answer subscribed by him; that he knows the contents of the said answer; that the same is true of his own knowledge except as to matters therein stated to be alleged on information and belief, and as to those matters he believes it to be true.

HENRY GERBER.
ANTON ANDREAS.

Sworn to before me this first day of Nov., 1887.
[L. S.] GEO. HEIBERGER,
Notary Public, Kings Co.

Endorsed: Answer. Filed Nov. 9, 1887.

United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
against
HENRY GERBER and ANTON ANDREAS, Sued as ANTON ANDREWS. } In Equity.

The replication of John T. Underwood and Frederick W. Underwood, complainants, to the answer of Henry Gerber and Anton Andreas, in the bill of complaint named Anton Andrews, defendants.

These repliants, saving and reserving unto themselves now and at all times hereafter all and all manner of benefit and advantage of exception which may be had or taken to the manifold insufficiencies of the said answer, for replication thereunto say that they will aver, maintain, and prove their said bill of complaint to be true, certain, and sufficient in law to be answered unto, and
15 that the said answer of the said defendants is uncertain, untrue, and insufficient to be replied unto by these repliants; without this, that any other matter or thing whatsoever in the said answer contained material or effectual in the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things these repliants are and will be ready to aver, maintain, and prove as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

JAMES A. HUDSON,
Solicitor and of Counsel for Complainants.

Endorsed: Replication. Filed Dec. 5, 1887.

16 At a stated term of the circuit court of the United States for the eastern district of New York, held at the court-house, in the city of Brooklyn, on the 6th day of April, 1888.

Present: Hon. E. Henry Lacombe, circuit judge.

JOHN T. UNDERWOOD *et al.*
vs.
HENRY GERBER *et al.*

On the annexed affidavit of the defendants it is ordered that Henry W. Sackett be, and he hereby is, substituted as solicitor for the defendants, and the clerk of this court is directed to note such substitution on the record.

E. HENRY LACOMBE.

United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD *et al.*
vs.
HENRY GERBER *et al.*
In Equity.

UNITED STATES OF AMERICA,
Eastern District of New York, } *ss:*

Henry Gerber and Anton Andras, being duly severally sworn, each for himself says that he is one of the defendants herein; that Cornelius A. Runkle, the former solicitor for the defendants, died at the city of New York on or about the 19th day of March, 1888, since which time Henry W. Sackett has been retained as solicitor for defendants, and an order is respectfully asked for substituting him as such solicitor.

17

HENRY GERBER.
ANTON ANDRAS.

Sworn to before me this 5th day of April, 1888.

GEO. HEIBERGER,
[L. S.] *Notary Public, Kings Co.*

Endorsed: Order of substitution. Filed and entered April 6th, 1888.

18 United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDRAS.
In Equity.

It is hereby consented that Briesen, Steele & Knauth be substituted as solicitors for defendants in my place and stead, and that an order may be entered accordingly.

Dated New York, July 5, 1888.

HENRY W. SACKETT,
Solicitor for Defendants.

At a stated term of the circuit court of the United States for the eastern district of New York, held at the United States court-rooms, in the city of Brooklyn, on the 9th day of July, 1888.

Present: The Honorable Charles L. Benedict, district judge, holding the court.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDRAS.

Upon the consent of Henry W. Sackett, solicitor for defendants, and on motion of Briesen, Steele & Knauth, it is—

19 Ordered that the said Briesen, Steele & Knauth be, and they hereby are, substituted as solicitors for the defendants in the place and stead of Henry W. Sackett.

CHAS. L. BENEDICT.

Endorsed: Consent and order of substitution. Filed and entered July 9, 1889.

20 Circuit Court of the United States, Eastern District of New York.

Present: Honorable E. Henry Lacombe, circuit judge.

FEBRUARY 1, 1889.

Appearances: James A. Hudson, Esq., counsel for complainants; A. V. Briesen, Esq., counsel for defendants.

Mr. Hudson reads the following testimony, taken on the part of the complainants under and pursuant to the 67th rule of the Supreme Court of the United States, as amended:

The testimony of JAMES R. GALLAGHER, a witness called on behalf of the complainants, who, having been duly sworn, testified:

Q. 1. What is your name, age, residence, and occupation?

A. James R. Gallagher; age, 38; residence, Buena Vista, Hudson county, N. J., and occupation, book-keeper.

Q. 2. Have you ever purchased any transfer paper of the kind known as carbon paper to the trade of the defendants; if so, when and where?

A. I purchased, in November, two dozen sheets of semi-carbon paper of Gerber's, at 78 Nassau street.

Q. 3. Can you fix the date of the purchase?

A. Not specifically; it was between the 5th and 10th of November.

Q. 4. What did you do with the paper?

21 A. I took it to my office where I was employed, in the Cotton Exchange building, room 79, put it in my desk and locked *in it*, which desk no one else had access to.

Q. 5. What next did you do with it?

A. I kept it continuously in that desk until I took it home to my residence; placed it under lock and key until I was requested to

deliver part of it to Professor Morton at the Stevens Institute, Hoboken; gave him a part of it, and then sealed up the box containing the rest of it, and I now produce that box, with the papers in it, and I broke the seal here before the examiner.

Q. 6. What is this printed circular that I find in the box along with the carbon papers?

A. It was given to me by those parties in lieu of a bill when I bought the goods.

Q. 7. These carbon papers seem to consist of two lots, one with an irregular cutting and the others nearly square pieces. Were they of the same lot?

A. Yes, sir.

The carbon papers produced by the witness are marked in evidence as Compl'ts' Exhibit Gallagher's Purchase No. 1, Feb'y 23, 1888, J. A. S., spec. ex'r, and the printed circular is marked Compl'ts' Exhibit Printed Circular, Feb'y 23, 1888, J. A. S., spec. ex'r.

Q. 8. How, if at all, did you mark the sheets or parts of sheets of the paper that you delivered to Prof. Morton?

A. By writing my name across the back of each of the semi-carbon sheets and numbering two corners of each sheet.

Q. 9. Examine these sheets of paper and see if you can identify those as being the papers, or some of them, that you delivered to Prof. Morton.

A. I identify those papers as being some of the papers I delivered to Prof. Morton.

22 The papers referred to are offered in evidence and marked Compl'ts' Exhibit Gallagher's Purchase No. 2, Febr'y 23, 1888, J. A. S., spec. ex'r.

Mr. Briesen reads cross-examination as follows:

X Q. 10. Mr. Gallagher, where is your place of business?

A. My place of business was at 79 Cotton Exchange building.

X Q. 11. Where is your place of business now?

A. At 30 Vesey street.

X Q. 12. With whom are you at present in business?

A. I am with J. Underwood & Co., the complainants in this action.

X Q. 13. Are you employed by them or are you a member of their firm?

A. I am employed by them.

X Q. 14. In what capacity are you employed by them?

A. Outside salesman, soliciting orders for their wares.

X Q. 15. Do you mean by their wares carbon paper?

A. Inks, carbon papers, and ribbons.

X Q. 16 Were you in the employ of complainants in November, when you made these purchases?

A. I was not and did not expect to be.

X Q. 17. At whose instance did you make these purchases?

A. I made the purchases at the instance of John T. Underwood, one of the complainants.

X Q. 18. Were not all the acts you have testified about as to the purchase of this paper and what you did with it done at his instance?

A. Yes, sir.

X Q. 19. By what you identify the papers you have testified about as being some of the papers you delivered to Prof. Morton?

23 A. By name James R. Gallagher, written by me across the back of the semi-carbon sheets and by the numbers on the corners thereof.

X Q. 20. Can you tell from whom you purchased this paper, the name of the party?

A. I did not ask for any names.

X Q. 21. You state that the circular was given to you by the parties of whom you purchased in lieu of a bill. Did you ask for a bill?

A. I did, sir.

X Q. 22. What was done when you asked for the bill?

A. The circular was handed me and the price marked thereon.

X Q. 23. Please point out on the circular where the price is marked on it.

A. By the index finger of a hand drawn opposite 8 x 12.

JAMES R. GALLAGHER.

Sworn to before me—

JOHN A. SHIELDS,
Special Examiner.

Mr. Hudson reads testimony of HENRY MORTON, called as a witness on the part of the complainants, who, having been duly sworn, testifies as follows:

Q. 1. What is your name, age, residence, and occupation?

A. Henry Morton; fifty-one years of age; I reside in Hoboken, N. J., and I am president of the Stevens Institute of Technology.

Q. 2. What experience have you had in connection with the subject of chemistry?

A. For more than twenty-five years a large part of my time has been employed in the study and practice of chemistry, including the making of chemical analyses and the examination of chemical processes employed in the arts.

24 Q. 3. What experience have you had in the examination of patents involving chemical processes and in giving testimony in connection with the same in the United States district courts?

A. For more than fifteen years most of my time not occupied by my official duties has been taken up with the examination of chemical patents and the processes set forth therein and in giving testimony in suits before the United States district courts upon such patents.

Q. 4. Have you read and do you understand United States letters patent No. 348,073, dated August 24th, 1886, granted to John T.

Underwood and Frederick W. Underwood for reproducing surfaces for typewriting and manifolding?

A. I have read this patent and believe that I understand it.

Q. 5. Please state what you understand to be the subject-matter of those letters patent.

A. A product, being a sheet of material or fabric, such as paper coated on one or both sides with a material consisting of a precipitate obtained from some vegetable dye stuff, such as logwood, united with oil, wax, or like oleaginous material, so as to be fit for use as a means of producing multiple copies in a typewriting machine or by other equivalent means.

The patent referred to by the witness, which is the patent mentioned in the bill of complaint, is marked in evidence Exhibit Complainants' Patent, Febr'y 23, 1888, J. A. S., spec. ex'r, and, by consent of counsel, a Patent Office copy is marked instead of the original.

Q. 6. Have you here and can you produce papers that you have carefully examined?

A. I have here two packages or bundles of sheets of what is commonly known as semi-carbon paper, which I have carefully examined.

25 The witness produces the package already marked Gallagher's purchase No. 2 and another package, which is now marked Complainants' Exhibit Shultz's Purchase No. 2, Febr'y 23, 1888, J. A. S., spec. ex'r.

Q. 7. When and where did you receive these packages of semi-carbon papers—from whom, if you know? What examinations did you make of them or parts of them and with what results?

A. On the 15th of February, the present month, I received from Mr. J. R. Gallagher the package marked Complainants' Exhibit Gallagher Purchase No. 2, and on the same day I also received from Mr. A. L. Schultz the package marked Complainants' Exhibit Schultz Purchase No. 2. Both these packages were handed to me at my office, in the Stevens Institute of Technology, and I examined some sheets from each package in the following manner: I took a portion from one or more sheets in each package and treated them in an ether-extracting apparatus with ether, so as to remove all material soluble in ether. This would include wax, oil, and any similar oleaginous substance. This was done in two operations, the paper from the Gallagher purchase being treated in one operation and the paper from the Schultz purchase in another operation. After this treatment with ether the black coating on the paper was so loose that I easily brushed it off with the blade of a knife as a fine black powder. These black powders I then tested by a variety of tests applicable to logwood and like bodies, and obtained results which showed me conclusively that the material with which the paper had been coated consisted largely of the coloring matter of logwood. Among these tests, for example, was the following: I dissolved a little of the powder in hot water to which a little hydro-

chloric acid had been added. This produced a yellowish solution. To this solution I added a little bichloride of tin, whereupon
26 the solution acquired a bright red color, which I can best describe as being a rose color with a purpleish shade. To the solution in this condition I added a little ammonia; thereupon there was at once formed a precipitate of a blueish lilac tint. These reactions are all characteristic of the coloring matter of logwood, and an ordinary extract of logwood treated in the same way will produce the same results.

I also took portions of paper from each of the two packages and burned them separately, so as to collect the ashes from each. This ash in each case when treated with nitric acid gave a light blue solution, and on the addition of ammonia to this there was formed a bulky pale-blue precipitate, which, on the addition of more ammonia, dissolved with the production of an intense violet blue color. I also added to some of the nitric-acid solution diluted with water a little ferrocyanide of potassium, whereupon there was found a heavy brown precipitate. These tests applied to the ash of the papers are characteristic of the substance copper and prove the presence of that material in notable quantity in the black powder obtained from and used in coating the paper. All the tests which I have described were applied separately to the coating or black powder obtained from each of the samples of paper, namely, the one distinguished as Gallagher and the one distinguished as Schultz.

Q. 8. Have you preserved the papers that you so examined or parts of them and can you produce them here?

A. I have preserved the papers treated by extraction with ether and here produce them, and also some of the material that was obtained by that extraction.

The witness produces two vials containing paper, and they are marked respectively Compl'ts' Exhibit Morton-Gallagher
27 Paper and Morton-Schultz Paper, February 23, 1888, J. A. S., spec. ex'r.

The witness also produces a vial containing some of the oleaginous matter referred to in his descriptive answer, and it is marked Compl'ts' Exhibit Oleaginous Matter, Febr'y 23, 1888, J. A. S., spec. ex'r.

Q 9. Have you made up and subjected to any tests the composition of matter described in the patent in suit? If so, tell us exactly what you did and what results you obtained, and compare such results with the results obtained from the treatment of the coating matter obtained by you from the Schultz and Gallagher papers referred to by you, and specimens of which have been marked as exhibits.

A. I prepared a logwood precipitate according to the directions given in the patent in lines 41 to 52, inclusive, and applied to it the tests for logwood and copper which I have already described, obtaining identical results with those which I have already related. I also applied to all these materials, namely, the powders taken from

the Gallagher and Schultz papers and the logwood precipitate, which I myself prepared as above, another test, namely, the addition of a little bichromate of potash to their hot solutions. This, in each case alike, produced simply a brown coloration of the liquid and showed an identity of reaction in this case between the product of the patent and the coloring matter or powder removed from these so-called semi-carbon papers.

Q. 10. If to the mixture that you made following the teachings of this patent you had added oil and wax in substantially the proportion mentioned in lines 53, 54, and 55 of the patent and then ground up the mixture in a warm state and applied it to paper substantially like the paper of the Schultz and Gallagher exhibits, what
28 difference would have existed, if any, between that production and the semi-carbon papers now before us and marked Exhibit Gallagher Purchase No. 2 and Exhibit Schutz Purchase No. 2?

A. There would have been no substantial difference whatever.

Q. 11. Have you preserved and brought with you a part of the powder by you scraped off the Gallagher and Schultz papers after the oleaginous matter was removed therefrom by ether? If so, please produce them.

A. I have preserved portions of those powders and here produce them.

They are marked Compl'ts' Exhibits Morton-Gallagher Powder and Morton-Schultz Powder, Febr'y 23, 1888, J. A. S., spec. ex'r.

Q. 12. In your treatment of the powders scraped from those papers, of which you have brought us specimens, did you find a precipitate of logwood or of Brazil wood, sapan wood, peach wood, or madder?

A. I found a precipitate of logwood.

Cross-examination of the witness is waived, counsel for the complainants stipulating that at any time before the complainants' case is rested the witness may be recalled by defendants and examined with the same latitude as upon cross-examination.

HENRY MORTON.

Sworn to before me this 23d day of February, 1888.

JOHN A. SHIELDS,
Special Examiner.

29 Mr. Briesen reads testimony of—

ALFRED L. SCHULTZ called as a witness on the part of the complainants, who, having been duly sworn, testifies as follows:

Q. 1. What is your name, age, residence, and occupation?

A. Alfred L. Schultz; aged 26; residence, Brooklyn, N. Y., and occupation, wood engraver.

Q. 2. Have you heretofore purchased from the defendants any semi-carbon papers, or papers so-called in the market; and, if so, when and where did you purchase it and what did you do with it?

A. I purchased carbon paper from Mr. Gerber, whose office is on

Nassau street, on September 30th, 1887. I retained it in my office until February 15th, when I delivered it to Professor Morton, at Stevens institute, in Hoboken.

Q. 3. Did you deliver it all to him?

A. No; I retained a portion of it.

Q. 4. Can you produce that portion?

A. Yes, sir; I can and do produce it.

The papers referred to are offered in evidence and marked Complainant's Exhibit Schultz Purchase No. 1, February 23, 1888, J. A. S., special ex.

Q. 5. Examine the papers marked Exhibit Schultz Purchase No. 2 and see if you can identify them as the papers delivered by you to Prof. Morton about the middle of the month.

A. Yes, sir; these are the papers I delivered to Prof. Morton.

Cross-examination by Mr. RUNKLE:

X Q. 6. Mr. Schultz, what is your business?

A. Engraver on wood.

X Q. 7. Where is your place of business?

A. In Temple court.

X Q. 8. At whose instance did you purchase these papers?

A. At Mr. Fraser's instance. I understand he is the complainants' patent solicitor.

X Q. 9. By what do you identify the Exhibit Schultz Purchase No. 2 as the paper that you delivered to Prof. Morton?

A. By the manner in which it is torn from the other portion.

X Q. 10. At what place did you make this purchase?

A. At Mr. Gerber's shop or office, at 78 Nassau street.

Redirect examination by Mr. HUDSON:

R. D. Q. 11. Did they give you the box which is now before you in which to carry away the paper?

A. They did.

R. D. Q. 12. Did it have the label on it that is now there?

A. It had.

Complainants' counsel cuts the label from the box, and it is marked Complainants' Exhibit Gerber's Label, February 23, 1888, J. A. S., spec. ex'r.

A. L. SCHULTZ.

Sworn to before me this 23d of February, 1888.

JOHN A. SHIELDS,
Special Examiner.

It is stipulated that Patent Office copies of patents may be used in lieu of originals by either party, subject to correction at any time on comparison with the originals, and with the same force and effect as the certified copies.

It is further stipulated that neither party shall seek to enforce

against the other the rule for limiting the time of taking testimony without first giving thirty days' written notice of his intention so to do.

Complainants rest.

31 United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD *et al.*
vs.
HENRY GERBER *et al.*

NEW YORK, *May 2d*, 1888—229 Broadway.

Met, pursuant to notice annexed, before John A. Shields, Esq., special examiner.

Present: James A. Hudson, Esq., of counsel for complainants, and A. v. Briesen, Esq., of counsel for defendants.

Counsel for defendants states that he has caused a subpœna to be served upon Porfessor Morton for the purpose of examining him on cross-examination, pursuant to the stipulation on the 23d February, 1888, and that Professor Morton is now present.

31*a* United States Circuit Court.

JOHN T. UNDERWOOD *et al.*
against
HENRY GERBER *et al.*
} In Equity.

To James A. Hudson, Esq., sol. for complainants:

Please take notice that the complainants' witness, Morton, will be called for cross-examination by the defendants herein, at the office of Briesen & Steele, No. 229 Broadway, in the city of New York, on the 2nd day of May, 1888, at eleven o'clock in the forenoon, at which cross-examination you are requested to be present.

Dated April 30th, 1888.

Yours, &c.,
HENRY W. SACKETT,
Sol. for Defendants, 154 *Nassau Street, New York.*

Endorsed.

"Due service of a copy of the within notice is hereby admitted, but right to cross-examine the witness is disputed.

Dated April 30th, 1888.

JAMES A. HUDSON,
Compl'ts' Sol'r."

32 Counsel for complainants objects that no right to cross-examine the witness, Professor Morton, exists in the defendants at this time. The stipulation made on the 23d February and noted on the record of the proceedings of that day does not reserve to the defendant- any right to cross-examine the witness, as the case for the complainants was rested on the 29th of February, and, as appears by the record, the defendants have since that time examined witnesses on their own behalf.

Counsel for defendants proceeds with the examination and propounds the following question:

X Q. 13. In analyzing the precipitate that you found on the Complainants' Exhibit Schultz Purchase No. 1, did you ascertain that any alkali or any acid was used in said precipitate?

Counsel for complainants instruct the witness not to answer any question that may be put as cross-examination, but will not object to the examination of the witness, he being present, if defendants' counsel will put upon the record a statement that the witness is examined on behalf of the defendants.

The witness responds that his feeling in the matter is to answer any question that may be put.

Counsel for complainants give notice that he will ask the court that the testimony that may be given by Professor Morton be treated as if the witness had been called on behalf of defendants, and that he will so treat the examination in the matter of objections as it proceeds.

A. I did ascertain that soda was present in notable quantity in the precipitate, and therefore must have been used in the preparation.

33 X Q. 14. Did you find any ferrocyanide of iron in said precipitate?

A. I did not.

X Q. 15. And are you positive that the same is not contained therein?

A. It is not contained in any notable proportion, but might exist as a trace or insignificant amount.

X Q. 16. Is it, in your opinion, possible to make a black pigment or precipitate as black as that on the said Schultz paper by merely using sulphate of copper and soda in the presence of a dissolved extract of logwood?

A. I think it is substantially—that is to say, I have myself prepared such a precipitate in the manner indicated and found it to be a substantially black precipitate like that which I obtained from the Schultz Exhibit. As such precipitates prepared at different times from identical materials and by identical treatments often differ slightly in the shade, it did not occur to me to make any close comparison between the precipitate I made myself and that which I obtained from the Schultz Exhibit. As to their precise shades of color, I am therefore unable to say which of these had in fact the darker shade, both of them being substantially black.

X Q. 17. Supposing that a black pigment obtained by adding an alkali and sulphate of copper to a dissolved extract of logwood had been known to the art and used as a black pigment prior to 1885, what, if any, invention would appear to your mind, as an expert in patent causes, to be disclosed in the claim of complainants' patent?

A. There would have been disclosed a discovery and invention, the discovery being that the black pigment in question would operate successfully in combination with oleaginous matter and paper in the

production of a reproducing surface on typewriting and manifold writing, and the invention would consist in the combination
34 of such precipitate with paper by the aid of suitable oleaginous materials, such as oil or wax, in the production of such reproducing surface, having been properties possessed by this material which is produced by following the methods disclosed in this Underwood patent.

X Q. 18. Supposing that the same black pigment had long prior to 1885 been mixed with oleaginous matter for use as a printers' ink, would the application of that mixture to paper for the purposes specified in the patent, in your estimation, amount to the exercise of inventive faculties?

A. I do not think that the application of the old printers' ink to paper could constitute an invention unless the composition of said printers' ink was so modified as to suit it for the new purpose. If, however, the character and proportion of the oleaginous matter with which the black pigment was mixed was modified, then I think clearly the same discovery and invention would exist in this case as in the one before assumed, namely, the discovery that this black pigment was available for this new use by these new combinations, and the invention of these new combinations with the consequence of securing a new result.

X Q. 19. Will you please, with the comp'ts' patent before you, state what, if any, limitation or specification as to character and proportion of oleaginous matter you find therein?

A. I find, in the first place, the limitation as to proportions and characteristics which are involved in the general statement that invention relates to an improved reproducing surface. This would clearly limit the proportion and characteristics of the oleaginous substances to such as were adapted to the production of such surfaces as distinguished from those suitable for the manufacture of printing inks or the like. Thus, for instance, in the preparation of a printing ink the object aimed at is to secure a material which in its main properties shall be precisely opposite to those called
35 for in a reproducing surface. In other words, it is highly desirable that when the printing ink has been applied to paper it shall remain where applied and not come off, while in the reproducing surfaces the object is that the pigment applied should continue to come off as long as possible. This would naturally call for the use of oleaginous substances, which in the one case should hold the pigment to the paper promptly and permanently, and in the other case allow it to come off little by little for a long time. It is furthermore stated at line 32 and subsequently, "The precipitate is then mixed with lard oil and wax or their equivalents," and, this having been specifically stated, it necessarily follows that what other substances are referred to in general terms such substances must be the substantial equivalents of lard oil and wax and not the equivalents of the drying oils and varnishes, such as are commonly used in the manufacture of printing inks.

X Q. 20. Do you know what oleaginous matters were used in the

preparation of carbon papers before 1885 and the characteristics and proportions thereof?

A. Only generally—that is to say, I know that wax and fixed oils were the materials commonly employed, but I have no knowledge as to the exact proportions.

X Q. 21. Supposing that in and before 1885 ordinary carbon paper was made by adding black pigments to wax and lard oil and spreading the mixture on paper, and supposing likewise that the black precipitate of the Underwood patent was well known and in the market as a black pigment, what invention would you find disclosed in complainants' patent?

A. Under the assumption of your question I should still find substantially the same discovery and invention that I have already stated, namely, the discovery that this pigment admitted of the combination and use set forth in this patent and the invention of so combining and using it.

36 X Q. 22. You have probably noticed that in my cross-question No. 19 I inquired about proportions of oleaginous matter which the patent of the complainants set forth. Won't you kindly answer that branch of the question 19?

A. I supposed that I had answered this in substance, but will say again that I understand the proportions indicated in the patent to be the proportions suitable for the production of reproducing surfaces generally. There is, however, beginning with line 53, a specific statement as to one set of proportions which would embody the invention, these proportions being to every two pounds of precipitate one pound of oil and one pound of wax.

X Q. 23. In what proportions did you find logwood extract, sulphate of copper, soda, and oleaginous matter on the Schultz paper which you have examined?

A. I did not attempt to make a quantitative analysis and therefore cannot say in what proportion these different constituents existed.

X Q. 24. In your answer to direct question No. 7 you do not refer to the fact that you found soda in the Schultz purchase nor to the manner of finding the same. Won't you please describe how you satisfied yourself of the presence of soda?

A. I did not refer to this in my direct testimony because it was rather an incidental than a direct test, and therefore not prominently in my mind. It was made as follows: When burning the paper coated with the pigment to obtain the ash which I tested for copper and when doing the same thing with the powders scraped from the papers I noticed a bright yellow coloration in the flame in which the ash was heated, which was very intense when a little hydrochloric acid was added to the ash, and the same was then introduced into the pale blue flame of a Bunsen burner. This is a common quantitative test for soda.

37 X Q. 25. In analyzing Schultz purchase No. 2, did you test any of the sheets now on the exhibit or sheets not now in existence?

A. To the best of my recollection, in the case of this exhibit I took

out entire sheets from the package, and therefore parts of the very sheets which I examined must still exist in the package Complainants' Exhibit Schultz Purchase No. 1, because this last-mentioned exhibit contains portions of all the sheets, other portions of which were given to me.

X Q. 26. In speaking about your test for logwood in answer No. 7 and of the characteristics of the coloring matter of logwood, what authority have you for assuming that the reaction and characteristics testified to by you pertain to logwood?

A. I have not intended to testify to their characteristics as being those distinctively of logwood, but of logwood extract. Where I have used the word logwood without this limitation it was only in a general sense involving the general idea that the coloring matter of logwood extract was substantially that of logwood. My knowledge as to the reactions about which I have testified is derived from my own experience obtained by preparing logwood extract and applying to it as well as to the logwood extract of commerce the tests which I have described.

X Q. 27. When did you ascertain those facts?

A. In a general way from time to time during the last twenty-five years, but the exact comparison as to the color and appearance of precipitates about which I have testified was made by me when making the tests a few months ago.

X Q. 28. What I intended to ask you was, when you first ascertained that certain reactions are characteristic of logwood, do you mean by your last answer that that was only done by making the tests last referred to, namely, a few months ago?

38 A. No. What I mean is that in a general way I had applied such tests many years ago, but that, as the identifying shades of color and the like by description or from memory is a very difficult and uncertain matter, I repeated all these tests with logwood extract side by side with the other materials I was testing, so as to make sure that the characteristic was certainly present and that it was not merely resemblances with which I was dealing.

X Q. 29. Is the complainants' patent, in your opinion, confined to a black precipitate of dye matter?

A. Not by its own terms.

X Q. 30. When did you first produce from extract of logwood a black precipitate or any other precipitate?

A. About thirty years ago I began making for my own use a logwood writing ink by mixing together solutions of logwood extract and bichromate of potash. Under these circumstances precipitates of a blue black color were sometimes formed. Also from time to time during the last thirty years I have occasionally treated logwood extract in testing it or exhibiting its reactions with ammonia, ch-oride of tin, chloride of zinc, and other reagents with the production of light-color precipitates.

X Q. 31. Ammonia ranks as an alkali, does it not?

A. It does.

X Q. 32. You have stated that in the defendants' precipitate you

found copper. How does that fact lead you to know that the salt of copper had been used?

A. Because I know of no way in which copper could have got into this product unless it had been introduced as a salt.

X Q. 33. And were your tests such as would reconvey the salt into metal?

A. No. The tests which I have mentioned recognized the copper in the condition of salts of copper, though it would have been
39 perfectly easy to have obtained the copper in its metallic state had I wished to do so.

X Q. 34. Then when you say, in answer to question 7, that the tests applied to the ash of the papers are characteristic of the substance copper, you meant not copper, but salt of copper?

A. No; what I meant was that the tests were such as proved the presence of the element copper in the material tested, and I did not mean that these tests of themselves decided whether the element existed in its metallic state or in combination as a salt or as several salts.

X Q. 35. Upon what principle does the addition of the salt of copper and on alkali transform the coloring matter in the extract of dyewood into a black pigment?

A. The general chemical principle is that when elements or compounds combine under the influence of chemical affinity the resulting products or compounds have properties different from those of their constituents. As to what these differences shall be there is no known law, and two white constituents may make a black compound, or two black ones a white compound, or one of any other color.

X Q. 36. Is it not known in the art of making dyes that a mixture of substances each having its own peculiar color would produce an entirely different color, and does not that law apply to the case here at issue?

A. No, I know of no such law. We may mix together certain dyestuffs and thereby get as a result a simple mixed color; as, for example, we can mix a yellow dye with a blue dye and thereby obtain a green dye, while in other cases we may mix together a yellow dye or coloring substance with a red dye or coloring substance and thereby obtain a lilac dye or color. In fact I doubt if any conceivable combination could be suggested for which an illustration could not be found, the characteristics of all such actions being their utterly irregular or non-predictable character.

40 X Q. 37. Then Ure's Dictionary is wrong in predicting that an extract of logwood if treated with sulphate of copper and soda produces a black precipitate; does not that follow?

A. Entirely so. As a prediction prior to knowledge obtained by experiment, such a statement would be entirely without foundation.

X Q. 38. What is contained in Comp'ts' Exhibit Oleaginous Matter?

A. I have not attempted to determine its composition, but it is the matter which either dissolved out from the papers treated in the extracting apparatus and was obtained by distilling the ether off

from a solution which it formed as it repeatedly drained through the papers until most of the ether had been so removed, and then allowing the remainder to evaporate in an open vessel on a water bath; the solid residue so left was then in a liquid state, as it melts at a moderate heat, and was poured into the bottle in which I now find it.

HENRY MORTON.

Sworn to before me—

JOHN A. SHIELDS,
Special Examiner.

41 The testimony taken on the part of the defendants under and pursuant to the 67th rule of the Supreme Court of the United States, as amended, read as follows:

Mr. Briesen reads testimony of ANTON ANDREAS:

Q. 1. What is your name, age, residence, and occupation?

A. Anton Andreas; residence, 620 Myrtle avenue; age, 33; manufacturer of carbon and typewriter ribbons.

Q. 2. Do you know the complainants?

A. Yes, sir.

Q. 3. Did you know John Underwood, the father of the complainants?

A. Yes, sir.

Q. 4. What was the business of John Underwood?

A. Manufacturing chemist.

Q. 5. And manufactured carbon papers?

A. Yes, sir.

Q. 6. Were you ever employed by John Underwood; and, if so, when and where?

A. Yes, sir; New Durham, New Jersey, in 1880. His factory was there.

Q. 7. How long were you employed with Underwood?

A. Until 1887.

Q. 8. When did John Underwood die?

A. I guess in 1882.

42 Q. 9. And the business was then carried on by the complainants?

A. Yes, sir.

Q. 10. What were you employed as in the factory of John Underwood?

A. Preparing carbon paper and grinding and whatever came along, for the first year, and after that preparing carbon paper alone.

Q. 11. Did you see them prepare the mixtures used in connection with the carbon paper while at work with John Underwood in New Durham, New Jersey?

A. Yes, sir.

Q. 12. Who mixed the ingredients that you saw?

A. Mr. Frederick W. Underwood, one of the complainants.

Q. 13. As I understand it, to prepare carbon paper certain arti-

cles or ingredients are mixed together, which, after certain processes are gone through, leaves a precipitate which is spread upon the paper. Is that so?

Question objected to as leading.

A. Yes, sir.

Q. 14. That is, as I understand it, after the solution of certain ingredients or mixtures has been filtered the precipitate removed is mixed with lard oil and wax. Is that so?

Question objected to as leading and as improper method of examining a witness in chief, counsel substituting himself in place of the witness for the purpose of giving testimony.

A. Yes, sir.

Q. 15. Tell me where in the factory this mixing of the ingredients was done.

A. In my presence; small factory about 20 feet wide and 30 feet long; no partition; small cupboard, and the mixing was done outside of the cupboard, in my presence.

43 Q. 16. Was there a solution or extract of logwood used in preparing the paper?

Question objected to on the ground that the competency of the witness as a chemist is not established; (2) that the question is leading; (3) that if it is intended to prove by this witness that he had prior knowledge of the subject-matter of the patent his name should have appeared in the answer without being so named it is not competent to attempt to prove prior knowledge by him.

A. Yes, sir.

Counsel for defendants, by consent of the complainants' counsel, amends his answer herein filed by inserting among the names of those alleged to have had prior knowledge that of the witness now on the stand.

Q. 17. How do you know that they used solution or extract of logwood?

A. I seen it marked on the boxes. I opened them, dissolved some myself while there, and filtered them and set it to dry.

Q. 18. And is it the same extract that you are using now in preparing the carbon for defendant Gerber?

A. Yes, sir.

Q. 19. Do you know whether the precipitate obtained was mixed with lard oil and wax?

A. Yes, sir.

Q. How do you know that?

A. I have seen it mixed in.

Q. 21. Was it continuous?

A. I saw it continually from 1880 to 1885.

44 Q. 22. Did they remove their factory in 1883?

A. The factory was moved in 1883; part of it.

Q. 23. Where to?

A. About four blocks in the same town.

Q. 24. Did you continue at work in the new place?

A. Yes, sir.

Q. 25. Doing the same kind of work; and, if not, what kind of work?

A. Preparing semi-carbon, which was substantially what I had been doing before.

Q. 26. When was the factory, if at all, removed to Brooklyn?

A. In 1885; fore part of 1885; in April or May.

Q. 27. During the time from 1880 that you were employed by John Underwood and, after his death, by the complainants how many sheets of carbon paper, on an average, did you prepare a day?

A. Fifty an hour.

Q. 28. When the factory was moved to Brooklyn was the mixing or preparation done in your presence?

A. No, sir.

Q. 29. Where was it done?

A. On the fourth floor; it was a special room.

Q. 30. Was that open to all the workmen or private for the complainants?

A. It was supposed to be private for the complainants, but he called us in once in awhile when he wanted a man to help him out.

Q. 31. Would he have any of the workmen present in Brooklyn when he did the mixing of the ingredients?

A. He never interfered.

Q. 32. Did he permit any of the workmen to come into the room while he was mixing in Brooklyn?

A. He did not allow that.

Q. 33. Then, as I understand it, after the factory was moved to Brooklyn, in 1885, a separate room was partitioned or set aside where complainants worked secretly or privately to make the mixture in question?

A. Yes, sir.

45 Q. 34. Was there any such secrecy during the time the factory was in New Durham?

Question objected to on the ground that the witness ought to be asked the manner in which the manufactory was conducted and not a conclusion as to whether it was a secret or otherwise.

A. No, sir.

Q. 35. Under what name was the business carried on, if you know, during the life of John Underwood?

A. All I know, John Underwood.

Q. 36. Was the same business continued and carried on after his death?

A. Continued right on.

Q. 37. By the complainants?

A. Yes, sir.

Q. 38. Under what name, if you know?
A. John T. Underwood & Co.

Mr. Hudson reads cross-examination:

X Q. 39. In what year did you first become acquainted with Mr. Underwood, now deceased?
A. 1880.
X Q. 40. What was your business at the time you became acquainted with him before you went into his employ?
A. Making willow-work—basket-maker.
X Q. 41. And previous to that time what was your business before you became a willow-worker?
A. I worked on an ice wagon.
X Q. 42. Did you ever have anything to do with chemicals before you went into the employ of Mr. Underwood?
A. No, sir.
X Q. 43. When you first went with Mr. Underwood what work did you go at?
A. Grinding.
X Q. 44. What did you grind?
46 A. Different inks for carbon and ribbons in a paint mill.
X Q. 45. And how long did you keep at that kind of work?
A. About a month.
X Q. 46. Who else was employed in that place during that month?
A. A man by the name of Laraby.
X Q. 47. Do you know his first name?
A. Joseph.
X Q. 48. Where is he now?
A. I could not say.
X Q. 49. How long did he remain there?
A. I don't know whether it was two or three months.
X Q. 50. Well, after that month had passed what next did you do in that shop?
A. I started to prepare carbon.
X Q. 51. Now, tell me what you did when you say you started to prepare carbon?
A. I put the stuff on the paper—on full carbon and semi-carbon.
X Q. 52. Well, what you mean is that you got a black, pasty mass from somebody and spread it on paper?
A. Yes, sir.
X Q. 53. How long did he continue at that?
A. Until I left.
X Q. 54. During the first year that you were there who else did that kind of work?
A. I did it all.
X Q. 55. Who made the paste that you spread upon the paper?
A. Fred. Underwood.
X Q. 56. All the time?
A. Yes, sir.

X Q. 57. Who ground it after the first month?

A. I did it sometimes, and then we had another man there who ground some.

X Q. 58. Now, you said that you had seen Mr. Fred. Underwood make the mixture that you applied to the paper How long did it take him to make a batch of it?

47 A. About ten or fifteen minutes to mix it; not to make the whole chemical.

X Q. 59. And when you made it how long did it take you?

A. I never made it; once in awhile I mixed the wax in.

X Q. 60. Well, is that all that you ever did toward making it—mix the wax in?

A. Yes, sir.

X Q. 61. You were asked a question on direct examination that I think you could not have understood. In question 13 counsel used this language: "As I understand it, to prepare carbon paper certain articles or ingredients are mixed together which, after certain processes are gone through, leaves a precipitate, which is spread upon the paper. Is that so?" and you answered, "Yes." Now, I want to know what you understand by the word precipitate, as counsel used it in that question.

A. First the logwood, when the logwood is boiled and filtered, take probably a week before it is dry; then it is mixed with different oils and wax; then, when it is dry it is mixed with this lard oil and wax ground in a warm state and then distributed on the paper.

X Q. 62. In that factory over in New Durham did you see them boil logwood?

A. Yes, sir.

X Q. 63. During what year?

A. 1881.

X Q. 64. Did they do it when you first came with them?

A. Yes, sir; I seen it filtered. It was two days before New Year's that I went there, and in 1881 I seen it boiled and filtered and dried, opened the box myself, and put it in the boiling water myself.

X Q. 65. How did you know what it was that you put in the boiling water?

A. I could see it on the box.

X Q. 66. What did it look like?

A. Brownish black.

48 X Q. 67. Did it look like bark?

A. No, sir; it was the extract, I suppose, from the wood.

X Q. 68. What did it look like?

A. Like pitch tar—brownish.

X Q. 69. Broken up like ground coffee?

A. No, sir; solid mass like coal-tar pitch.

X Q. 70. Well, when you boiled this what did you do more with it, if anything?

A. Put it in a barrel and let it settle for a day or two and then put it in bags to drain.

X Q. 71. Now, after it had drained through the bags what did you ever do with it?

A. Spread it out on boards to dry.

X Q. 72. What did you spread on the boards to dry, that which was caught inside of the bags?

A. That which was caught inside of the bags—the remains.

X Q. 73. And what dripped down out of the bags, what became of that?

A. It was thrown away.

X Q. 74. Now, after that had been dried, did you ever do anything else with it?

A. No, sir; sometimes I had to powder it with an iron mortar.

X Q. 75. Have you been using that same kind of material and going through that same operation since you have been working with Mr. Gerber?

A. Yes, sir.

X Q. 76. While you was over at New Durham, in the factory there, didn't they change their method of handling what you call dye-wood?

A. No, sir; changed to larger boxes—from fifteen-pound boxes to 30.

X Q. 77. That is, they bought it in larger quantities?

A. Yes, sir.

X Q. 78. When did you leave the employ of these complainants?

49 A. About a year now; either the latter part of March or first of April, 1887.

X Q. 78. Do you know how many different kinds of papers for typewriters' use Mr. Underwood made before they left that factory in New Durham?

A. Yes, sir.

X Q. 79. You testified to carbons and semi-carbons?

A. Full carbons and semi-carbons.

X Q. 80. By that you mean what?

A. There is a No. 1 black carbon; then there is a purple carbon, semi-carbon; then there is duplicating carbon; then there is a permanent full carbon; then there is an ordinary full.

X Q. 81. Now state the distinction between carbon and semi-carbon.

A. Semi is only on one side and the full is done both sides.

X Q. 82. That is, the carbon papers having two surfaces coated with the mixture is what you call full carbon and that which has but one surface coated with the mixture is what you call semi-carbon?

A. Yes, sir.

X Q. 83. Did you use in coating papers all the different colors of mixtures you have mentioned in describing the paper?

A. Yes, sir.

X Q. 84. Now, tell me again how many colors or mixtures were used over in that factory in New Durham.

A. Black, purple, and blue.

X Q. 85. And were there not different shades of blue?

A. No, sir.

X Q. 86. Did you know while you was over there how the blue paste or mixture was made?

A. Yes, sir; I knew it.

X Q. 87. How did you find it out?

A. By my own knowledge.

X Q. 88. Did you know at that time how the purple mixture was made?

50 A. Yes, sir.

X Q. 89. How did you learn that?

A. I could not help learning it; I seen it.

X Q. 90. What gave it the purple color?

A. When the powder comes it is naturally that way.

X Q. 91. What gave the black mixture its color?

A. The logwood.

X Q. 92. And what gave the blue mixture its color?

A. The blue is naturally blue.

X Q. 93. And you made up all of these colors of paper while you were in the New Durham factory before coming to Brooklyn?

A. Yes, sir.

X Q. 94. Did they make all colors before they moved from the one shop to the other in New Durham?

A. They did but one.

X Q. 95. You will have to explain what you mean by your answer.

A. They did all but one color and that is purple.

X Q. 96. Did they not while you were with them also make a copying mixture for use on the paper?

A. Yes, sir.

X Q. 97. What was its color?

A. Blue.

X Q. 98. Was the material blue when put upon the paper?

A. Well, kind of brownish, look blue when you look through it.

X Q. 99. What did you do with the papers when you had covered them over with the mixture over in that New Durham shop?

A. I laid them one side, and then they were put between papers.

X Q. 100. Did you put them between papers?

A. Once in awhile.

X Q. 101. And that is the last you saw of them?

A. Yes, sir; and I put them even, so many hundred just as called for, and handed them to Mr. Underwood.

51 X Q. 102. Were you kept pretty busy while over there?

—. Yes, sir; very busy.

X Q. 103. Didn't have much time to stand around to see what other people were doing?

A. No, sir.

X Q. 104. You said you made on an average of fifty sheets an hour; did you mean by that coated on one or both sides?

A. One side.

X Q. 105. You don't mean to be understood that you averaged fifty

sheets an hour during all the years you were over there in the New Durham shop?

A. Yes, sir.

X Q. 106. Fifty sheets an hour, ten hours a day, 300 working days in the year; do you mean you made an output as great as that?

A. That was my regular day's work; some days 600, some days 800, some days 1,000, up as high as 1,200.

X Q. 107. And how long did you work in those two New Durham shops?

A. Up to 1885.

X Q. 108. From the last of 1880 up to April or May, 1885, I think you said?

A. Yes, sir.

X Q. 109. After you commenced putting the material on the paper who did the grinding of the paste?

A. A man named Phil. Gerhardt.

X Q. 110. Where is he?

A. He is still there.

X Q. 111. Who else?

A. A man named John Sykes, in New Jersey, another named Andrew Major, and another named Henry Dethorn.

X Q. 112. Where is Sykes in New Jersey?

A. A place called West New York.

X Q. 113. And where is Andrew Major?

A. I believe he is in West New York.

X Q. 114. And where is Dethorn?

52 A. In the employ of Mr. Underwood.

X Q. 115. How do you know extract logwood when you see it or handle it?

A. I see when it is marked on the box, extract of logwood, it is the same stuff that I used to-day, the same size box and all.

X Q. 116. Is there any other way you could distinguish extract of logwood from other chemicals?

A. I think I could now, extract of logwood.

X Q. 117. Suppose I should put before you three or four specimens of chemicals having the general appearance to the eye as logwood extract, do you think you could pick out the extract of logwood from the others?

A. I could.

X Q. 118. What test would you apply to determine that it was extract of logwood?

A. I could taste it, or try ether.

X Q. 119. How would you try it with ether?

A. Take a small solution of it and see what color it turned right away.

X Q. 120. What effect would ether have upon it?

A. Turn it red.

X Q. 121. Immediately?

A. Yes, sir.

X Q. 122. Do you mean to say it would color a solution of the ex-

tract of logwood red, or would it color the drug in its solid state red?

A. It would turn red right away.

X Q. 123. What do you mean; the fluid?

A. Yes, sir; the nitric acid would do it—turn it yellow.

X Q. 124. Don't you know that ether will turn many other solutions red?

A. I don't know; I have not tried that.

X Q. 125. And don't you know that nitric acid will turn many other things yellow?

A. I don't know that; I haven't tried that.

X Q. 126. Now when did you learn that ether would turn a solution of logwood red?

53 A. In New Durham.

X Q. 127. Who taught you that?

A. Mr. Underwood.

X Q. 128. Which Mr. Underwood?

A. Fred. Underwood.

X Q. 129. Tell us how that came about.

A. I seen him test the sheet. I seen him test the sheet of his own carbon.

X Q. 130. How do you know he tested it with ether?

A. Because he put some of it on my hands and told me it was ether.

X Q. 131. And did it turn that sheet of paper red?

A. Yes, sir; it turned it red.

X Q. 132. So you think ether is a test that will distinguish the presence of extract of logwood?

A. Yes, sir.

X Q. 133. Why did you leave the employ of Mr. Underwood?

A. He would not let me work in the shop. All the rest of the men wanted to leave on account of a misunderstanding with me, and Mr. Underwood would let me work out of the shop at home, but not in the shop.

Mr. Briesen reads redirect examination:

Q. 134. Are you a chemist?

A. No, sir.

Q. 135. And whatever knowledge you obtained concerning the preparation of carbon papers did you obtain while at work with John Underwood and subsequently with the complainants?

A. Yes, sir.

Q. 136. Are you at present preparing the defendant Gerber's carbon paper?

A. Yes, sir.

Q. 137. And have been since when?

A. Since July, 1887.

54 Q. 138. Are you using in such preparation the same extract of logwood that you saw used, as testified by you, in the factory in New Durham?

A. Yes, sir.

Q. 139. You say that the logwood you saw used in those factories was in boxes. Was there any mark upon that box?

A. Yes, sir.

Q. 140. What was the mark on it?

A. Extract of logwood.

Q. 141. Is there any extract of logwood used in the purple and blue carbons?

Objected to as immaterial.

A. No, sir.

Q. 142. After you got through spreading the paste upon the paper was it ready for use?

A. Not until it has been interleaved between newspapers and put into the press.

Q. 143. Then, after it got interleaved and pressed it is ready for use, or must an additional process be gone through?

A. No, sir; unless you want to put an extra polish on it.

Q. 144. You spoke of preparing fifty sheets an hour. Do you mean fifty sheets every hour or an average of fifty sheets?

A. On an average.

Mr. Hudson reads recross-examination:

X Q. 145. What are your business relations with Henry Gerber, the other defendant?

Objected to as being improper upon recross-examination and as immaterial and irrelevant.

55 A. Employed there.

X Q. 146. You manage the manufacturing business, do you not?

Objected to on the same ground.

A. Yes, sir.

X Q. 147. Did he know how to manufacture the paper when you went with him?

Objected to on the same ground as before and also as calling from the witness an opinion of the knowledge of another person.

A. No, sir.

X Q. 148. What was his business, then?

A. A butcher.

Mr. Briesen reads further redirect examination:

Q. 149. Did you ever ask your codefendant concerning his knowledge of the manufacture of carbon paper?

A. No, sir.

Mr. Hudson reads further recross-examination:

X Q. 150. Did he come to you and ask you to manufacture car-

bon paper for him or did you go to him and ask him to go into the business?

A. I went to Mr. Gerber.

ANTON ANDREAS.

After having been read to the witness subscribed and sworn to before me this 14th day of March, 1888.

HENRY L. BRANDT,
Notary Public, Kings County.

Certificate filed in N. Y. Co.

56 Mr. Briesen reads direct examination of JOHN T. UNDERWOOD, called as a witness for the defendants:

Q. 1. Mr. Underwood, you are the complainant in this action?

A. Yes, sir.

Q. 2. Were you served with a copy of a subpœna of which I show you the original?

A. Yes, sir.

Q. 3. When?

A. Monday afternoon, about five minutes after three.

Q. 4. Was any fee paid or tendered to you at that time?

A. Yes; there was $1.50.

Q. 5. And the original shown you?

A. Yes, sir.

Subpœna shown is marked Defendants' Exhibit No. 1, April 12, 1888.

57 Q. 6. Did you produce the books called for in that subpœna or any of them?

A. By advise of counsel I decline to produce the books on this subpœna.

Counsel for complainants desires to state upon the record that under the general language of the subpœna served he has advised the complainants that he was not obliged to produce any book or paper; that under a subpœna designating any particular book or books he will advise the witness to produce such specified book or books.

Q. 7. What is your father's name?

A. John Underwood.

Q. 8. Where was he born?

A. In London, England. He was a practical manufacturing chemist. He came to this country in 1872. He commenced business here, a continuation of his business on the other side, manufacturer of writing fluids, copyable printing inks, and any other specialty that might be called for. He was in business at 89 Liberty street, New York. His factory was there. I don't know exactly how long he remained there; probably six months—eight or nine months, perhaps. I was working with my father all the time in his factory there. He opened a factory at New Durham, New Jersey,

about 1875—I think '75 or '76; I don't know which. The business was carried on under the name of John Underwood from the time that he started till about 1876, after that by the name of John Underwood & Company. About '78 or '79 he had a partner by the name of Judson K. Rogers for about six months, after which time it was terminated. He then carried on business with myself and brother under the name of John Underwood & Company.

Q. 9. Were yourself and brother partners with him?

58 A. There was no paper of partnership at all. Neither did we receive any stipulated salary during his lifetime.

Q. 10. Did you share in the profits with him?

Complainants' counsel objects to the question as immaterial.

A. Virtually we were partners, though there was no agreement, such not being necessary, there never having been any quarrels.

Q. 11. Was there ever any accounting?

A. No, sir; we drew what we wanted out of the concern and the balance went to the business.

Q. 12. Did you assist him in the factory or in the business—that is, the office branch?

A. Part of the time at the factory, part of the time at the office; principally at the office.

Q. 13. When did your father die?

A. June, 1881.

Q. 14. Do you know whether prior to his death any carbon or semi-carbon paper was manufactured by him?

A. I do.

Q. 15. Was there?

A. There was not.

Q. 16. Have you in your possession the books of the firm of John Underwood & Company prior to his death?

A. I believe so. I cannot state positively. I have not seen them but believe they are there.

Q. 17. Did you keep those books or had you any supervision over them?

A. I did.

Q. 18. What books were kept?

A. Regular books of account.

Q. 19. Did you have a sale book?

A. We did.

Q. 20. Did that book contain the entry of sales made in the business?

A. It did.

59 Q. 21. Have you produced that sales book?

A. Upon the advice of counsel I did not produce any book under the subpœna served.

Q. 22. Was any carbon paper manufactured, either full or semi, by the business carried on under the name of John Underwood & Company prior to the death of your father?

A. There were a number of kinds.

Q. 23. Including, I suppose, black semi-carbon?

A. Including several kinds of the black semi-carbon.

Q. 24. When did the firm of John Underwood & Company commence the sale of semi-carbon paper?

A. That I cannot state, because I do not know without referring to memorandum.

Q. 25. Tell me as near as you can from recollection.

A. I should say about 1878 or 1879; possibly 1880.

Q. 26. Was the business of John Underwood & Company continued after the death of your father?

A. It was, by myself and brother, one of the complainants to this suit.

Q. 27. Your brother who is present here?

A. Yes, sir.

Q. 28. Under the same firm name?

A. Yes; no variation and no agreements whatever between us as partners.

Q. 29. And did the firm of John Underwood and Company, after the death of your father, continue the manufacture and sale of semi-carbon paper and carbon paper?

A. We continued the sale and manufacture of various full and semi-carbon paper and other specialties in connection with the business.

Q. 30. You moved your factory to Brooklyn, did you not?

A. We did; we moved about April, 1885.

Q. 31. Since your father's death has the firm kept books of account?

A. It has.

Q. 32. Including the sales books?

A. Yes, sir.

Q. 33. And does that sale book contain entries of sales of
60 carbon and semi-carbon papers made by John Underwood & Company?

A. It does.

Q. 34. Have you produced that sales book?

A. By advice of counsel I decline to produce any book under the subpœna served.

Q. 35. Has your firm sold carbon paper to E. Remington & Sons?

A. No, sir.

Q. 36. Has it sold it to the firm of Wyckoff, Seamans & Benedict?

Complain-t's counsel objects to the question as immaterial, and unless some limit of time is put upon the question counsel instructs the witness not to answer, the question being in the nature of an improper inquiry of a rival manufacturer into the complainants' business.

A. I decline to answer under instruction of counsel.

Q. 37. Did you sell to the firm of Wyckoff, Seamans & Benedict carbon paper prior to 1882?

A. I believe not.

Q. 38. Prior to January, 1883?
A. I believe not.
Q. 39. Did you prior to January, 1884?
A. I believe not.
Q. 40. Did you prior to July, 1884?

Complain-ts' counsel objects to the question on two grounds: the first as immaterial and irrelevant to the issue as to any date after the 22nd of March of that year; and, second, as irrelevant unless the question be limited to the kind of carbon paper described in the patent in suit.

A. I believe not.

61 Q. 41. Would your sales book show when you commenced to sell carbon papers to them?

Same objection.

A. It would.
Q. 42. Did your firm ever purchase any extract of logwood from R. W. Robinson & Company?
A. They did not.
Q. 43. At any time?
A. Not that I know of.
Q. 44. Or from Robinson & Company?

Objected to; unless the question be limited in time it is immaterial and irrelevant.

A. They did not.
Q. 45. From whom does your firm purchase extract of logwood?

Objected to, and the witness is instructed not to answer, as the question has no pertinency to any matter at issue in this suit.

Q. 46. During your father's lifetime did you at any time prepare or mix the ingredients necessary for the preparation of carbon paper?
A. Once or twice or more, I believe.
Q. 47. Have you done so at any time since his death?
A. Once or twice.
Q. 48. Can you tell me how to prepare carbon paper?
A. I can.
Q. 49. And can you tell me all the ingredients?
A. I can.
Q. 50. And the quantity required?
A. On reference to memorandum I can do so.
Q. 51. Memorandum made by whom?
A. By myself.

Q. 52. On suggestion from your brother?

62 A. No.

Q. 53. Are you willing to swear, Mr. Underwood, that you mixed ingredients necessary to prepare carbon paper three times since your father's death?

A. I am willing to swear that it was more than three; exactly how many I cannot tell.

Q. 54. And these different times it was without the assistance of your brother?

A. It was without any assistance whatever.

No cross-examination.

Mr. Briesen reads direct testimony of ALEXANDER B. FERNALD, a witness called on behalf of the defendant-.

63 By Mr. BRIESEN:

Q. 1. What is your name, age, residence, and occupation?

A. Alexander B. Fernald is my name; age, forty-two; I reside in Jersey City, at 451½ Jersey avenue; am employed by L. H. Rogers, of 75 Maiden lane, New York city.

Q. 2. What is the business of L. H. Rogers?

A. Manufacturer of carbon paper and manifold paper.

Q. 3. How long have you been in the business of making carbon paper?

A. I have been in the employ of Mr. Rogers about eight or nine years, and I have made carbon paper for six years.

Q. 4. How was carbon paper made six years ago?

A. By mixing lampblack and any kind of coloring matter with oil, with lard, with beeswax, or with all together; sometimes we used paraffine, paraffine wax.

Q. 5. When you used beeswax and lard oil in combination with the pigment or black matter, about how much beeswax and lard oil did you use?

A. It would depend upon the use of the paper; we added beeswax enough to give it consistency, so that we could handle it with our fingers and it wouldn't smut by handling it with the fingers.

Q. 6. About how much of oil?

A. Just about the same quantity; a pound of lard oil.

Q. 7. What kind of pigment or coloring matter was used six and more years ago in making carbon paper?

A. All kinds of coloring matter.

Q. 8. Name some.

A. Well, first and chiefly, the different kinds of lampblack, lampblack made from burning of kerosene oil and from burning of rosin and tar, and also what they call drop-black, from burning of beef and other bones, and we also used all kinds of colors—green, red, purple, purple lakes, and indigo.

Q. 9. What are lakes?

64 A. Lakes I understand to be precipitated from any kind of coloring matter like logwood.

Q. 10. How are such lakes produced; do you know?

A. By the action of mineral salts upon coloring matter.

Q. 11. Were you in this country six and more years ago when you practised the making of carbon paper in the manner described in your previous testimony?

A. Yes, sir.

Q. 11½. Where?

A. Right at 75 Maiden lane. I never made it anywhere else but at that place.

Q. 12. Do you know how the mixture which you say you applied six and more years ago on carbon paper compared with printers' ink?

A. Well, they are about just the same as printers' ink, with the exception they use different kinds of oil, a drying oil.

Q. 13. Such as what?

A. Linseed oil; on carbon paper we use a non-drying oil.

(Direct examination closed.)

Mr. HUDSON reads cross-examination as follows:

X Q. 14. What was your business before you went into this firm's employ?

A. Immediately before I was employed as a machinist.

X Q. 15. And when you went into the employ of this firm what was your business there?

A. He hired me to perfect and develope a machine for the manufacture of the postal letter sheet now adopted by the United States Government.

X Q. 16. And after that?

A. After that I was getting up different machines for him as a mechanic. He had a little shop there where he had a lathe and planer, and everything we needed. Mr. Rogers asked me if it was possible to make a machine for making carbon paper; I told him it was; meantime, when we had this shop we had a man making carbon paper at one end of the shop, and when Mr. Rogers asked me about this machine I went and investigated and studied it the best I knew how as to the different mixtures and different ingredients.

X Q. 17. Why was it necessary for you to understand the ingredients in order to enable you as a machinist to make a machine to spread the mixture on paper?

A. Because if I didn't understand the ingredients, the consistency, and what it was made of and the action it had I would not be able to make a machine to make carbon paper.

X Q. 18. Will you explain why?

A. Because prior to using the machine I would have to understand what was in that, whether it was used hot or cold and what was in it, and whether it was a drying substance and the different things that was in it, because, as I understood, he would use one mixture and sometimes another different ingredient, and I had to understand that mixture and how it was applied to the paper before I could undertake or would undertake to make a machine to make carbon paper.

X Q. 19. Was it necessary you should know what the coloring matters were and how they were produced?

A. Not how they were produced particularly, but know what coloring there was in that, and also to know the proportion in the

mixture of these coloring matters, and sometimes they would act different.

X Q. 20. Act different in what way?

A. Sometimes they would be of different consistencies; the object of my looking at that was, when I made a machine I wanted to make a machine that would make different kinds of carbon paper or different kinds of tracing paper and adapt itself to make different kinds and sorts on that one machine.

X Q. 21. You wanted to make a machine with which you could spread a surface on paper?

66 A. Yes, sir; on one or both sides.

X Q. 22. And you made a machine that would make a surface on tracing paper as well as on carbon paper?

A. Tracing paper is carbon paper or paper with coloring matter on.

X Q. 23. That is the only tracing paper that you know of?

A. Well, I am in the carbon-paper business; I suppose there are other papers they use, but I don't know anything about that.

X Q. 24. Explain to us—it does not seem to my mind clear—whether it is necessary that you should know if the coloring matter in a compound was a green mineral, or whether it was an indigo blue, for example, to enable you to make a machine to spread a composition of matter on paper.

A. Because I found that different coloring matters were used, Prussian blue with black, or indigo with black, and using beeswax in with the composition it would work different than it would if there was parra-fine put in with the composition, or if I colored the black with an aniline color and put in an oil or a parra-fine in there the action was different, and I had to study those things in order to make a machine that would adapt itself to use different ingredients.

X Q. 25. Do you mean to say that if you took the same quantities or proportions of a drop-black and of oil and of wax it would make any difference in the composition whether you colored it with indigo blue or with Prussian blue or with any of the greens that are used as coloring matters?

A. Yes, it would make a difference in the working of the machine; I found it made a difference in rubbing it on.

X Q. 26. Now, please tell us what mixtures you used in which you found that the coloring matters made a difference in working of the mass, where there was no difference in the mass save only in the coloring matter used.

67 A. I found if you used aniline to color black with and added oils the aniline wouldn't color the black.

X Q. 27. My question is what difference it would make—not the difference in the coloring material.

A. Well, I don't know that it would make any particular great difference, but it would make a difference in the quantity.

X Q. 28. My question is using the same proportions of the lard and beeswax and of lampblack. Tell us how it was that the addition of different kinds of coloring matter made a difference in the paste as used in your machine,

A. If you had more blue and less black then you would get a blue black and there would be less coloring matter in proportion to the beeswax and oil there was in it.

X Q. 29. But if the coloring matter be a deep black or a blue black how would that make any difference in the working of your machine? Did the coloring matter have anything to do with the working of the machine?

A. Oh, yes; sometimes you put more colors on and it would go through the paper, and that was my object in studying the colors, to know about the different things that they used so as to make this machine to adapt itself to the different mixtures.

X Q. 30. Wasn't there the same effect when the colors or coloring matters were applied by hand as by your machine?

A. Certainly; the same effect as when applied by hand as by machine; it wouldn't make any difference except the machine would apply it in a different manner.

X Q. 31. More evenly, perhaps?

A. Yes; and, understand, you can use with a machine a mixture of a different consistency than you can when it is applied by hand; for instance, I found I could use a machine that would use less oil; if I put the same amount of oil in the mixture as I did by hand it wouldn't turn out such a good carbon.

X Q. 32. That is, your machine would use a thicker mass than you did by hand?

68 A. Less oil.

X Q. 33. What, then, would liquify it?

A. O, any drying stuff; spirits of turpentine or benzine.

X Q. 34. Do you put this in in order to liquify?

A. Yes

X Q. 35. What proportions of benzine or turpentine?

A. Just enough so that the machine would work.

X Q. 36. Did you ever study chemistry?

A. No, sir; never studied it; not at school. I have read some.

X Q. 37. Did you ever make any study in producing aniline?

A. Yes.

X Q. 38. What kind of colors did you use?

A. When I was a boy my mother used to dye clothes and we used to make blacks, and I have also made coloring matters for dyeing, for marking linen.

X Q. 39. After you left your boyhood days behind you, have you worked at making colors?

A. Yes, sir.

X Q. 40. Did you make the colors for use in these carbon papers?

A. Sometimes I would make them and sometimes I would buy them; it is cheaper to buy them.

X Q. 41. What colors did you personally ever make—personally?

A. Me, personally? To make greens, why we take Prussian blue and yellow and add them together.

X Q. 42. What yellow?

A. Any yellow, most.

X Q. 43. Name one yellow that you ever used to make greens.

A. I don't know the names of yellows; there are so many different kinds I don't know them by name.

X Q. 44. You said you used lakes?

A. Yes, sir.

X Q. 45. Did you make them?

A. No, sir; I never made any lakes.

69 X Q. 46. Where did you get them?

A. Buy them.

X Q. 47. How do you know how they are made?

A. I know they are made according to the action of mineral salts on logwood.

X Q. 48. How do you know it?

A. I know it from reading chemistry books, such as I have at home and such as I have at the shop.

X Q. 49. That is the only way you know?

A. Yes, sir.

X Q. 50. Just name one.

A. The Encyclopedia Britannica.

X Q. 51. Anything else?

A. I have down at the shop a book that is called Allen's—I don't know the name. It is by a man named Allen. I have owned it now ten or twelve years.

X Q. 52. You don't remember anything more of its title?

A. Well, it is a book for all sorts of information. It was published here in New York. It was taken from the Scientific American—several hundred pages, and in that book is how to dye and bleach.

X Q. 53. Do you know who it is published by?

A. I think it is published somewhere here in New York.

X Q. 54. Do you know that lakes are made in other ways?

A. No; I do not. They are not made in any other way.

X Q. 55. Did you ever manufacture printers' ink?

A. No, sir.

X Q. 56. You have told on your direct examination how printers' ink was made. On what did you base that testimony?

A. From the knowledge I have from the same book—from reading. In fact, I have friends that are in the business. I got some of my colors from them, and a friend in the business has told me he used drying oil.

70 X Q. 57. Can you remember, as a matter of memory, when lakes were used by you in Mr. Rogers' shop for the first time? Be particular with your dates, if you remember.

A. Well, I wouldn't give any exact date, but certainly four or five years ago. Then after I built this machine I went to manufacture paper myself—hand-making it, you know.

X Q. 58. Before you built the machine?

A. A. No; afterwards. The girls we had were sometimes taken sick, and I used to make it myself, and got to make a regular business of it.

X Q. 59. Why did you make it by hand?

A. All the typewriter is made by hand.

X Q. 60. Your machine would make all kinds?

A. It would, but I haven't put on all the attachments.

X Q. 61. Not even until this date?

A. No, sir; but I manufacture the common kind of paper on it altogether.

X Q. 62. When did you commence manufacturing what you call the common kind of carbon paper as a regular thing for the firm?

A. Well, I don't know exactly; probably——

X Q. 63. Was it before the last presidential election?

A. Oh, yes; I think it is about four or five years ago; three to five years, somewhere along there. I don't remember exactly.

X Q. 64. Is there any fact by which you can fix it in your memory any closer than between three to five years ago?

A. No, sir; not that I know of.

X Q. 65. Was it before or after the time that you commenced to manufacture with that machine the ordinary carbon paper that you made these experiments and studied up the mixture?

A. Before.

X Q. 66. Before you made it at all?

A. Yes, sir.

X Q. 67. Before you commenced work on it?

71 A. Yes, sir.

X Q. 68. How long was you in making that machine before you went to work?

A. Well, I was studying and making the different kinds when I got leisure outside of my regular work, probably two years; from the time Mr. Rogers first spoke to me about it I was studying. Whenever I got a chance I was studying and investigating and asking about it.

X Q. 69. Who did you ask?

A. A man that was manufacturing for Mr. Rogers.

X Q. 70. Who was that man?

A. His name was Furl. He is now dead.

X Q. 71. How long ago did he die?

A. Two or three years. I don't know positively. I think a couple of years ago.

X Q. 72. Do you know where he died or was buried?

A. He wasn't buried at all. He was cremated, so his wife informed me.

X Q. 73. Do you know where he was cremated?

A. I don't know. I think out here in Long Island. I don't know where they have this place for burning them; up at Greenwood, I think, or out on Long Island. His wife told me she had him incinerated or cremated. I also asked Mr. J. C. Saxton, manufacturer of carbon paper.

X Q. 74. Did he do mixing too?

A. Yes, sir.

X Q. 75. Where is Saxton?

A. He is employed with Mr. Rogers, but he is sick at present.

X Q. 76. Are you now in the employ of Mr. Rogers?

A. Yes, sir.

X Q. 77. And still engaged in this business of manufacturing carbon paper?

A. Yes, sir; that is not my chief business, the carbon paper. I am a mechanical inventor or getting up machines for him and manufacturing styluses, &c., and looking after the mechanical
72 department. There is not a carbon made on the premises that I don't personally superintend.

X Q. 78. When did you first commence to superintend the manufacture of carbon paper?

A. Well, about the time, as I say, when I began to study into it for the inventing of this machine.

X Q. 79. You don't mean to tell us you began to superintend the mixing of materials at a time when you didn't know anything about them?

A. No; I didn't say that.

X Q. 80. When did you commence studying up to build your machine?

A. After I superintended the making of carbon paper. After the machine was built, I suppose, was three or four years probably.

X Q. 81. Was your machine running before Mr. Furl died?

A. No, sir. Before he died? Oh, yes, before he died.

X Q. 82. Why did you answer "no" first and then "yes"?

A. The impression I got was before he left the employ of Mr. Rogers.

X Q. 83. Did he leave the employ of Mr. Rogers before he died?

A. Oh, yes.

X Q. 84. How long?

A. Several years. He wasn't employed there steady all the time. Whenever Mr. Rogers wanted carbon paper he got Mr. Furl to come and make it. He had different parties come.

X Q. 85. Was Furl doing a business for himself as well as work for Mr. Rogers?

A. I don't know, but I suppose he was.

X Q. 86. Who else worked in Mr. Rogers' shop and had anything to do with the mixing of the material that was put upon the paper to make carbon paper while you was working upon your machine and getting it in condition to make carbon paper?

A. Well, that work upon the machine would take in
73 the time that I was studying it; had it in my brains, for instance.

X Q. 87. You may answer covering the whole period or limiting it, just as you please, from the time you put your thoughts on paper.

A. A man by the name of Mettag.

X Q. 88. Where is he now?

A. I couldn't say; somewhere in New York city.

X Q. 89. When did he work for Mr. Rogers?

A. That is about the time that I was inventing that machine for myself.

X Q. 90. Did he leave before the machine got to work?

A. Left before the machine was made.

X Q. 91. Name who else took any part in the mixing of the composition for carbon paper at that shop more than three years ago.

A. I don't remember of any more, except a girl that I had, but she didn't mix them.

X Q. 92. She wouldn't know anything about the component parts, I suppose, except in a very general way?

A. No, sir.

X Q. 93. Did you buy the materials out of which the carbon preparation was made?

A. Yes, sir.

X Q. 94. When did you begin to buy such materials; how long ago?

A. I don't know.

X Q. 95. Before you got your machine to work?

A. I don't know; I don't think that I did; I don't remember exactly whether I bought anything. If there was any coloring matter I wanted to experiment with I went out and bought it.

X Q. 96. That is a mere supposition?

A. Yes, sir; I have no recollection.

X Q. 97. Who bought the coloring matters from three years ago back used in that place?

74 A. I bought them three years ago myself; three years ago and perhaps four years ago I probably bought them, but before that Mr. Saxton used to buy them.

X Q. 98. You think you commenced buying them about four years ago?

A. Four, possibly five, years; I couldn't tell exactly.

X Q. 99. Might be three and a half?

A. Might be three and a half or four; I couldn't say.

X Q. 100. Tell me the earliest recollection of a purchase of lakes made by you and who it was purchased from.

A. Well, sir, I couldn't give any exact date for purchasing of lakes, because I don't remember.

X Q. 101. Do you remember of purchasing any yourself personally for use at that place?

A. Yes, sir; I recollect of buying lakes.

X Q. 102. From whom do you recollect making your first purchase, your earliest purchase of lakes?

A. I don't remember of a first purchase or any purchase. I would go to Devoe's or Reynolds.

X Q. 103. Name the first that you recollect of lakes.

A. I couldn't give a particular date or particular time of purchasing lakes.

X Q. 104. Nor the people from whom you bought?

A. Either one or the other; either Devoe or Reynolds.

X Q. 105. On Fulton street, New York?

A. Yes, sir.

X Q. 106. Do you remember what you called for?

A. I called—I don't remember now; I had the name and particular kinds of lakes on a memorandum and got them.

X Q. 107. Who gave you that memorandum?

A. I think I got it out of a book myself.

X Q. 108. Do you remember if this first purchase, or any of those early purchases, were in the form of a powder, or whether they were in a mass like colors ground in oil?

A. We always got them dry.

75 X Q. 109. At that time?

A. I never bought them ground in oil at all. I have no use for them; always dry colors.

X Q. 110. I am asking as a matter of memory now. Do you remember whether your first purchase of lakes was in tin cans or boxes or in bulks—quantity, by weight?

A. They were dry colors—lakes. I think I got them always dry.

X Q. 111. My question is whether you can remember whether you bought them by weight, weighed out to you, or whether they were in tin boxes.

A. I bought lakes in different ways; sometimes in tin boxes and sometimes in paper.

X Q. 112. My question relates now to your earliest purchase.

A. That is the earliest purchases as I remember.

X Q. 113. Do you remember as matter of memory that lakes were sold in this market in tin boxes as long ago as that?

A. I don't know.

X Q. 114. Just describe to me a mixture that you made for carbon papers wherein you used lakes when first you began to superintend the mixing of the materials.

A. Describe the mixture?

X Q. 115. How you do it and all about it.

A. Well, when we were making certain kinds of papers for certain kinds called for and we couldn't get the color we had to put other colors together; if the lake is a purple one and we want to darken it and put in other colors.

X Q. 116. Just describe a mixture for carbon papers that you made wherein you used lakes when first you began to superintend the mixing of the materials.

A. If we wanted to make a purple carbon paper we take a lake and mix it with oil and beeswax, and if that lake ain't fine enough we take and grind in a mill or any machine for grinding,

76 and then for a certain kind of paper where they use wax we have a hot table and apply it by hand.

X Q. 117. The question didn't go to the application, but to the making of the mixture. Your answer, as I understand it, is that you took purple lake, added beeswax and oil, and ground them together in a paint mill.

A. While they are hot it is put into a mass, mixed all hot, because the oil and wax won't mix unless hot.

X Q. 118. You took a kettle of some sort, I presume.

A. Yes.

X Q. 119. And put in what?

A. Lake, oil, and beeswax; put them all into it together and sometimes separately; then apply heat.

X Q. 120. Till you melt them altogether?

A. Yes, sir.

X Q. 121. But the lake wouldn't melt it, would it?

A. I don't think it would. I don't know; it wouldn't melt; it would mix with the beeswax and oil.

X Q. 122. While the oil and beeswax were being stirred up?

A. Yes; stirred up.

X Q. 123. Then what did you do next?

A. Then we put it in a paint mill or grinding machine.

X Q. 124. Did you let it cool then?

A. Oh, no; we kept it hot and the mill hot, too, and ground them all up together.

X Q. 125. Then was the mixture ready for use as soon as it cooled down?

A. When it was cool it was not ready for use; you have to keep it hot when you are using it.

X Q. When your mixture came from the paint mill I assume that you put it away and let it stand until you wanted to use it and then warmed it up again.

A. Yes; you could do that.

X Q. 127. Was that the ordinary way?

A. That depends whether you wanted to use it right then or not.

X Q. 128. Well, that was all the treatment it received;
77 *ti* was ready for use when it came from the paint mill?

A. Yes, sir.

X Q. 129. If I understand you correctly, Mr. Fernald, you made purples when you used these lakes—purple papers?

A. Well, I am speaking of purples now.

X Q. 130. Were those transfer papers?

A. What do you mean by transfer—carbon paper for use on the typewriter machine?

X Q. 131. Were those papers suitable for use on the typwriter or for manifolding by stylus?

A. Yes, sir.

X Q. 132. And gave off a purple impression?

A. Yes, sir.

X Q. 133. Did that make a copying ink or impression or surface?

A. Yes, sir.

X Q. 134. Perhaps you don't understand the question. Could you make copies from the paper that had received an impression from this paper that you made?

Mr. v. BRIESEN: He means whether the matter transferred from the carbon paper would then again be capable of producing a copy.

The WITNESS:

A. I don't know; I never tried that.

Mr. BRIESEN reads redirect examination:

Q. 135. You stated in your cross-examination that at some former time you had made experiments for producing a precipitate from extract of logwood, and I think you said in connection with material for making linen. Will you please state what those experiments were or what you did?

A. When I was a boy my mother used to take extract of logwood and I used to help her.

Q. 136. What did you do in helping her?

78 A. Well, I used to help her mix it—to put the logwood in and sulphate of copper or sulphate of iron, called copperas, and blue vitriol.

Q. 137. What did that produce?

A. That made a black. We used to make black with an extract of logwood.

Q. 138. In what form did it make the black, as liquid or precipitate?

A. As a liquid.

Q. 139. And not as precipitate?

A. Oh, it was all mixed together as a black.

Q. 140. When and where was that?

A. That, sir, was in the British provinces, in New Brunswick.

Q. 141. Twenty-five or thirty years ago?

A. More than thirty years ago.

Mr. HUDSON reads recross-examination:

X Q. 142. Are you quite sure your mother didn't use logwood and not logwood extract?

A. Yes; I know that.

X Q. 143. Are you sure that extract of logwood was an article of commerce in the market at that time?

A. Yes, sir; used to buy it.

X Q. 144. She put it in a kettle with water?

A. Yes, sir; water, copperas, and blue vitriol.

X Q. 145. And boiled it up?

A. Boiled it up and dyed clothes with it.

X Q. 146. And put the clothes in while it was hot?

A. Yes, sir.

X Q. 147. Right into the hot liquid?

A. I think so; whether it was hot I don't know positively.

79 X Q. 148. You don't remember now?

A. No.

A. B. FERNALD.

Subscribed and sworn to before me—

HENRY L. BRANT,
Special Examiner.

Mr. Briesen reads direct examination of STEPHEN T. SMITH, a witness for defendants:

Q. 1. What is your name, age, residence, and occupation?

A. Stephen T. Smith; 476 Greene avenue, Brooklyn; my age is 34; occupation, manufacturer of typewriter supplies, carbon paper, ribbons, &c.

Q. 2. How long have you been engaged in your present business?

A. About between 11 and 12 years.

Q. 3. Can you tell us how carbon papers were made 10 or 12 years ago?

A. Well, I first commenced to make carbon paper by simply grinding drop-black in tallow oil; afterwards lampblack, Prussian blue, and lard oil and wax, usually parra-fine or beeswax.

Q. 4. Parra-fine is a mineral wax, is it not?

A. Yes, sir.

Q. 5. How long ago has the mixture of wax, lard oil, and pigment for manufacture of carbon paper been employed in this country, to your knowledge?

A. As far as I know, about 12 or 13 years; about 13 years.

Q. 6. What is understood by the term "carbon paper"—merely a black paper?

A. No; not necessarily; it is used as a term for any paper that will act as an ink giving off its surface, impressed upon either with type or stylus.

80 Q. 7. What pigments have been used in the making of such carbon papers, say before the year 1880?

A. Well, I think I tried almost everything that I could hear of or knew of. For making black carbon there were principally used lampblacks, drop-black, boneblack, or blacks of that nature, and, if colored, they were principally lakes; sometimes other colors, earth colors; but almost altogether the lakes were used.

Q. 8. What do you understand by lakes?

A. Precipitate of some coloring matter from the solution by mineral salt, usually mineral salt.

Q. 9. Can you name some lakes that were known to you before 1880 as such coloring matter?

A. Yes; the lake commonly on the market, such as the mauve lake, is a precipitate of coloring matter. The first lake that I ever used in my business I used away back in 1877, I think.

Q. 10. You say that the lakes you speak about are precipitates of coloring matter. What kind of coloring matter was used for producing such lakes, if you know?

A. Well, I think as far back as that that the lakes were precipited altogether—all from wood; what I mean is solutions of dye-woods. Now a great many lakes are made from anilines, but then anilines were not so thoroughly well known as they are to-day.

Q. 11. Do you know Mr. John T. Underwood, who is now here present?

A. Yes; I am acquainted with the gentleman.

Q. 12. State what, if anything, took place between yourself and said Underwood respecting the use of dye-wood precipitates as a pigment on transfer fabrics?

A. I remember years ago, when I was working on the improve-

ment of typewriter ribbons, Mr. Underwood used frequently to come to my office. One day while there I showed him a ribbon, a piece of cloth saturated in oil and wax and precipitate of the solution of logwood; it also had in it a little violet aniline. Some years afterward, I think within the last two years, I mentioned it
81 to him and he said, "Oh, pshaw; that was a logwood precipitate you had there."

Q. 13. When was it first that you and Mr. Underwood referred to this logwood precipitate on the ribbon?

A. When he first saw it?

Q. 14. Yes.

A. I can figure it back pretty nearly to the neighborhood of six years ago, perhaps seven years ago.

Q. 15. At that time, six or seven years ago, do you know whether said John T. Underwood was aware of the fact that that ribbon contained the precipitate in question?

A. I think he recognized it instantly. I don't know.

Q. 16. Was anything said about it at that time?

A. No, sir.

Q. 17. You only surmise from the remark made by him two or three years ago that he understood six or seven years ago precisely what you were using?

A. Yes, sir.

Q. 18. In that ribbon you used a precipitate of extract of logwood, if I understand it correctly?

A. Yes, sir; it perhaps might be well for me to explain why I used it and how I came to use it.

Q. 19. No; wait until I ask you. I want to know where it was prepared or produced.

A. It was made not from the extract of logwood as known in commerce, but from a solution made from boiling logwood chips, and it was precipitated and colored by bichromate of potash.

Q. 20. The extract of logwood solution has what color?

A. A reddish brown I should call it.

Q. 21. The decoction of logwood which you used had what color?

A. Extract of logwood is simply that article evaporated down to a solid matter; extract of logwood is not always sold as solid matter. You can buy it in liquid form.

Q. 22. It would be only that decoction that you used on that ribbon?

82 A. Yes, sir; when thick-ned by evaporating the water out.

Q. 23. What are those ribbons used for that you are speaking about?

A. They are for transferring ink from the ribbon to a paper in the typewriter.

Q. 24. Those are the ribbons that make the first or main impression?

A. Yes, sir.

Q. 25. The carbon papers are used below the paper receiving the first impression for the purpose of making the second or further impression. Am I right?

A. Yes, sir; what is known as manifolding on the typewriter, which is the act of making two or more copies at one writing by the aid of transfer paper.

Q. 26. Was, to your knowledge, the use of a precipitate of dye matter with oil and wax for the production of carbon paper or other transfer fabric new in the year 1884?

A. No, sir.

Q. 27. In applying such a mixture as you have described how did you go to work? Please describe what you did in mixing and in the subsequent treatment of the mass until you got it on the paper.

(Counsel for complainants suggests that it is uncertain from the question to which of the answers it relates, as the witness has not described any compound made by him in any of his recent answers and the question may tend to confusion.)

(Counsel for defendants withdraws the question.)

Q. 28. I understand your testimony to be that more than six years ago oil and wax were mixed with pigment, sometimes with one kind, again with another kind, and that such mixtures were applied to paper or other fabrics. I would like you to tell us how those mixtures were prepared and also how they were applied to the fabric.

83 A. My mode usually has been, if using a lake, to grind it in oil and add certain portions of wax and apply it when hot to the substance, or, supposing I required a less quantity of oil, I would grind it in oil and turpentine or benzine or benzole; afterwards, by the aid of steam heat or the sun, evaporate the turpentine or benzine or benzole, as the case might be, and then add my wax. I never attempted to grind it hot but once—that is, not of recent years. I know that such things have *have* been done. I have a mill now and grind hot—not a paint mill, however—a German lithographer's mill. Lithographers' ink is ground hot, and has been for years. It was simply because I had no mill for doing so.

Q. 29. What difference, if you know, exists between the mixtures described by you for use on carbon paper and similar transfer fabrics and the mixture termed printers' ink?

A. Printers' ink, in the nature of it, is made as a drying substance; carbon for application to paper is usually formed of a non-drying substance—that is to say, oil other than coloring matter. Printers' ink as usually made is a combination of soap and oil boiled to a varnish, while carbon paper is usually made of a non-drying oil, such as lard oil, tallow oil, parra-fine oil, and wax. That could be varied, however, by a combination of all of them or part of them.

Q. 30. The transfer ribbons used in typewriter machines are coated with a matter analogous to that used on carbon paper?

A. Some of them; yes, sir. The ribbons that we call "record ribbons" are so coated—non-copying ribbons.

Q. 31. Of course copying ribbons would have to contain a soluble pigment?

A. A substance soluble in water.

Q. 32. Carbon does not necessarily contain a soluble pigment?

A. No, sir.

Mr. Hudson reads cross-examination:

84 X Q. 33. Are not the ribbons you speak of saturated rather than coated?

A. Yes; they are saturated.

X Q. 34. Isn't there a distinction between the saturating of a textile fabric and the coating of a paper?

A. Yes; there is a distinction, but almost the first ribbons made for use on the typewriter were paper ribbons coated. It has always been a hobby with typewriter men that paper would do the best work.

X Q. 35. How far does your memory of typewriters and the use of ribbons for them go back?

A. Ever since the typewriter amounted to anything.

X Q. 36. Do you remember when Mr. Yost introduced into New York his first typewriters that appeared here in use using capital letters only?

(Defendants' counsel objects as not cross-examination.)

A. I wouldn't answer that quite in that way. I don't know that Mr. Yost ever had a typewriter that could be strictly called his.

X Q. 37. Do you know if Mr. Yost ever introduced a typewriter in New York city?

A. Yes, sir.

X Q. 38. How many years ago was that?

A. It was before I went into the ribbon business. It must have been in the year 1874 or 1875, but I am not positive which year it was.

X Q. 39. Did you ever see a typewriter that used ribbons in use before you saw those introduced by him?

A. No, sir.

X Q. 40. Did you ever see any other that used a ribbon until the caligraph came before the public?

A. Yes.

X Q. 41. What was it?

A. The Hammond.

X Q. 42. About when did the Hammond come to public notice?

A. I refer to before it came to public notice. I saw it during the Centennial year.

85 X Q. 43. You spoke of a paper ribbon. Did you ever know of a paper ribbon being used on the typewriter that was introduced by Mr. Yost?

A. Never sold, but used in their own office; made there and used there.

X Q. 44. As a matter of experiment?

A. Yes, sir; mind you, it was beyond experiment as far as the ink was concerned; the experiment was only as to durability of the paper.

X Q. 45. With that machine, if you remember it, there was a silk ribbon introduced and that was a saturated ribbon, was it not?

A. Yes, sir.

X Q. 46. And after that came a ribbon of a cotton material?

A. Yes, sir.

X Q. 47. That was also a saturated ribbon, was it not?

A. Yes, sir.

X Q. 48. With the exception of the paper ribbons you saw used in that office saturated ribbons have been in use with all the typewriters ever since, haven't they?

A. Excepting in a few instances; there have been some business men have made ribbons for themselves; for instance, Mr. Johnson, of the firm of Seabury & Johnson, coated a ribbon on one side with a very thin solution of rubber; he also coated cloth upon one side with a very thin solution of gelatine and hardened it with exposure to a solution of alum; then upon the other side of the cloth he put the ink, his object being to prevent the filling of the type that struck upon the ribbon.

X Q. 49. That is, in each of these cases the ribbon was backed or sought to be backed by some material that would prevent the ink that had saturated the ribbon from coming in direct contact with the face of the type?

A. Yes, sir.

X Q. 50. Do you remember when the aniline colors first came extensively before the public—about what year?

86 A. I do not.

X Q. 51. Wasn't it shortly after the war?

A. I couldn't tell. I was too young then to be interested in such matters. I couldn't tell.

X Q. 52. Suppose the year was the year 1865?

A. I know by reading about the time they came in, but I don't know of my own knowledge.

X Q. 53. Were they not largely in use at the time you went into the business 10 or 12 years ago?

A. Quite extensively used; yes, sir.

X Q. 54. I understood you to say that the first lake you used was called mauve?

A. Yes, sir.

X Q. 55. Did that term apply to the color or material?

A. The mauve lake was applied more particularly to the color.

X Q. 56. Would one not expert in chemistry on purchasing from a store know whether the lake was made of a precipitate of dyewood or whether it was made of aniline colors?

A. They wouldn't know it by the simple fact of purchasing it and the name of it; they would only know by experimenting and analyzing it.

X Q. 57. If an ordinary purchaser asked for a lake in the stores, the term was sufficiently well known to apply so that he would either get that which was made from the vegetable or the mineral, according to what they had in stock?

A. Some colors have precipitates of one and some of another.

X Q. 58. How many O. K. colors of the lakes are there, do you know?

A. No, sir. How many lake colors there are?

X Q. 59. Yes; how many colors that you would call lakes.

A. You can count every color in the rainbow and make it a lake.

87 X Q. 60. How many of those colors, do you know, must necessarily contain a precipitate from the vegetable matter?

A. None of them to-day.

X Q. 61. They can all be made by the use of aniline colors?

A. Pretty near all—well, they can be used. Of course, the question——

X Q. 62. The question of choice is not before you now.

A. They can be made.

X Q. 63. What is the aniline color that you speak of? What is it made of?

A. They are primarily from coal tar.

X Q. 64. It is a product of coal tar?

A. Yes, sir.

X Q. 64½. A mineral substance?

A. Yes, sir.

X Q. 65. Are you a chemist?

A. In a small way. I am a photographer, and as far as that applies to chemistry I am a chemist.

X Q. 66. The ribbon inks that you made and used—were they ever used by you to make transfer papers?

A. The inks?

X Q. 67. Yes.

A. Yes, sir.

X Q. 68. Exactly as you used them on the typewriter ribbons?

A. With the leaving out of a little oil.

X Q. 69. That is, you used them on paper after they had been thickened?

A. Yes, sir.

X Q. 70. You had to change the proportion of the parts?

A. Yes, sir.

X Q. 71. The materials sufficient for the ribbons would not do in that form to give to a workman to put on paper?

A. No, sir.

88 X Q. 72. You were asked by Mr. Briesen, "Was, to your knowledge, the use of a precipitate of dye matter with oil and wax for the production of carbon paper or other transfer fabric new in the year 1884?" and you replied, "No." Be good enough to state what knowledge you had of the use of such a composition prior to the year 1884. Be particular as to your dates and the place where your knowledge was had.

A. I have done so much experimenting—that is, in the years I have been in this business—it is a hard matter for me to give precise dates. I know I haven't done much experimenting within the last four years. Most of my personal experimenting was done previous to that.

X Q. 73. And this answer relates to the knowledge you gained from your personal experiments?

A. Yes, sir.

X Q. 74. And that only?

A. That only.

X Q. 75. Not from what you gathered from the outer world—from the market?

A. Well, I might state that Mr. Underwood has been selling carbon for the last six years, I guess, at any rate. It may be seven years, and certainly it is years ago—five years ago at the very least. He made a logwood carbon from a precipitate from some dye-wood. I don't know whether it was logwood or not.

X Q. 76. How do you know that more than five years ago Mr. Underwood used a precipitate of some dyestuff—dye-wood—in the manufacture of his carbon papers?

A. From the action upon the papers of acids, alkali, &c., and having tested it.

X Q. 77. Did you know Mr. Underwood at that time?

A. Yes, sir.

X Q. 78. What relations existed between you?

A. We were very friendly. He was in opposition to me in business.

X Q. 79. Were you dealing in carbon paper at that time?

A. Yes, sir.

89 X Q. 80. Buying his papers?

A. No, sir; never bought any.

X Q. 81. How did you make the tests you speak of? How did it happen that you got them?

A. Well, I don't know; I test almost everything that comes along. If a man starts in opposition to me in business I send and get a sample of his paper and test it. I couldn't precisely tell from any analysis what kind of vegetable matter was in Mr. Underwood's carbon, but that it contained vegetable matter I am positive.

X Q. 82. Where was you living at the time you made these tests?

A. I was living in New York.

X Q. 83. What was the street and number of your house in New York?

A. When these tests were made?

X Q. 84. Yes, sir.

A. The number I couldn't give you; the street was 112th street, in Harlem.

X Q. 85. How long did you live in that house?

A. 2 years.

X Q. 86. When did you leave there?

A. Four or five years ago; about five years ago.

X Q. 87. In the spring time?

A. Left there in the spring, yes, sir.

X Q. 88. Do you know whether your name and address was in the directory when you left there?

A. Yes, sir.

X Q. 89. What circumstances fixes it in your mind that you made those tests when you lived in that house?

A. Because a very little while after that I went into the paper business and the general stationery business for typewriters.

X Q. 90. Where did you move to from 112th street?

A. Moved to 122d street.

X Q. 91. And why do you recall the fact that it was when you had left the 112th-street house?

A. I didn't say when I left there; I said about the time.

90 X Q. 92. About the time?

A. Well, I count back and I can fix the thing very definitely, because four years ago I enlarged my business very materially and took more room, went into the paper business extensively, and paid very little attention to the manufacturing business.

X Q. 93. You were a competitor of Mr. Underwood at that time, were you not?

A. Yes, sir; Mr. Underwood, more strictly speaking, was a competitor of mine, as I was in the business first.

X Q. 94. How long did you remain in the house 122d street?

A. Four years.

X Q. 95. When did you move from there?

A. About a year ago this spring, this May.

X Q. 96. Where did you make these tests with that paper?

A. 14 Park place.

X Q. 97. Where did you get that paper?

A. Sent a boy to buy it.

X Q. 98. What boy or boys did you send to buy it?

A. Not only this, however; I procured some of this paper from a lady by the name of Mrs. Rushton, who had a copying department in this city.

X Q. 99. What do you mean?

A. That is, an office for the taking of manuscript on the typewriter.

X Q. 100. An office for doing copying work?

A. Yes; she is in New York; Mr. Underwood can tell you.

X Q. 101. Have you a bill of the goods that you purchased of her?

A. No, never had enough; I don't know that I bought any; I don't remember of buying any excepting from Mr. Underwood.

X Q. 102. When did you buy that paper that you tested from Mr. Underwood?

A. I tested it and bought from him at different times.

91 X Q. 103. For the purpose of testing?

A. Yes; at different times along as I would have parties come in my office saying, "Mr. Underwood is making a good carbon now." Then I would send around and buy some—half a dozen sheets. I have some in my office now.

X Q. 105. I am talking about a time prior to 1884?

A. This has reference to just that time. The first paper I bought from Mr. Underwood his place was in Hoboken. I had somebody else send a letter to him. I think that first letter was—I forget

now—it was from one of the men now in my employ, but I am not certain as regards that.

X Q. 106. Have you a copy of that letter?

A. No, sir.

X Q. 107. What is that man's name?

A. Well, I am not certain as regards who I sent it by and I am not certain, even to-day, that I sent the letter, it is so long ago. I know I got some of Mr. Underwood's carbon.

X Q. 108. How do you know it was his?

A. Well, I suppose it was his.

X Q. 109. You are under oath.

A. I couldn't swear it was Mr. Underwood's.

X Q. 110. You have sworn it was Mr. Underwood's. I want to know how you know it was his.

A. I know it just as much as a man can know when he sends a boy on an errand and he brings you back an article that corresponds with what you sent him for. He might stop at some other store—you know how that is—but it isn't likely.

X Q. 111. Why didn't you send to Mr. Underwood direct in your own name if you wanted a specimen?

A. Because he wouldn't have been likely to send it to me.

X Q. —. Who was present when you tested that paper or any of those papers?

A. Nobody. I never have any one present when I do anything of that kind.

92 X Q. 113. How did you test them?

A. I would take——

X Q. 114. I would interrupt by asking you what you did.

A. I would first take the fatty matter off of the paper.

X Q. 115. How did you do that?

A. Sometimes with ether, sometimes with alcohol. Then I would test the substance remaining with acids and alkali, and then I would make a mark with the carbon remaining on the remainder of the sheet on a piece of paper and test it with chlorine or something of that kind.

X Q. 116. What would you make a mark upon the paper remaining for?

A. To see whether it were possible that there were any carbon in the matter—I mean any lampblack—knowing that if it were simply a dye-wood extract I could bleach it out with chlorine; but if it were lampblack, then you could only efface it in part.

X Q. 117. Lampblack would stay in part?

A. Yes, sir.

X Q. 118. How did you proceed to use your ether to remove the material from the paper—the oily material from the paper?

A. I would take a sheet of carbon, roll it in the shape of a cone or funnel, and put in a glass funnel to close the bottom entirely and filter alcohol or ether through it till all the fatty matter was out and the precipitate or sediment remainder in the cone.

X Q. 119. And you did this with some of the paper that you say was made by Mr. Underwood?

A. Yes, sir; delivered to me as Mr. Underwood's paper.

X Q. 120. By messenger or by mail?

A. By messenger almost entirely. I wouldn't like to swear for a certainty that I sent and got any by mail. I am not certain as regards that.

X Q. 121. How long did it take for the alcohol to filter through that paper?

93 A. It would filter through in a very short time, the paper being thin; then we would pour it back.

X Q. 122. Filter two or three times?

A. Yes, sir.

X Q. 123. It would pass through in half an hour or so?

A. Get through quicker than that; I didn't use any great quantity at one time; it is a very delicate operation, the paper being tissue paper; I had to be very careful or I would break the bottom of it and lose just what I was attempted to accomplish.

X Q. 124. After your alcohol had filtered through into the bottle what did you do next?

A. Took the precipitate matter and dried it.

X Q. 125. That is the matter remaining on the inside of your paper, and dried it?

A. Yes, sir.

X Q. 126. Then what?

A. Then tested it with acids, separating it in small infinitesimal proportions; my main object was to find out whether there were any carbon black in this paper; now, I at that time didn't believe and don't believe to-day it is a good policy to use the matter that Mr. Underwood is using in making carbon papers.

X Q. 127. You mean dye-wood precipitate?

A. Yes, sir; I never thought it was good policy to use it, but there was no question but Mr. Underwood's carbon was doing good work, and my object was to discover, if I possibly could, if there were anything in his carbon to render it more permanent; I was always afraid, and am to-day, that a carbon made from a precipitate of these dye-woods would cause trouble to papers intended to be permanent.

X Q. 128. The tests that you made with the acids, please describe more fully what acid you used and how you used it and what result you obtained from the acid test.

A. Well, with nitric acid, muriatic acid, and sulphuric acid.

94 X Q. 129. Did you use them all in making the same test?

A. No; separately.

X Q. 130. Did you use these acids pure or diluted?

A. Diluted.

X Q. 131. Largely diluted?

A. Sometimes; sometimes not very much.

X Q. 132. Did you get similar results by the use of each acid?

A. Almost; yes, sir.

X Q. 133. What result did you get?

A. On very small quantities of acid the matter would turn brown;

leave a brown stain; it would resolve the precipitate into a brown stain.

X Q. 134. By precipitate you mean the refuse that was left on the paper; it would resolve that to a brown stain when the acid evaporated?

A. No; when the acid had got through acting upon it; if I used strong acid it would eat it up entirely.

X Q. 135. Would it leave nothing?

A. It would slightly discolor the acid, nothing apparently to the injury of the acid.

X Q. 136. Those were the results you got from your acid tests?

A. Yes, sir.

X Q. 137. And what did you reason from those results?

A. Simply what I had set out to accomplish, that the matter was composed of a vegetable substance, not of a true carbon or burned black upon which acid would have taken no action.

X Q. 138. What next did you do; what were your alkili tests?

A. Tested principally with soda caustic.

X Q. 139. What form of soda?

A. Caustic soda.

X Q. 140. How did you make those tests?

A. In much the same form, taking a little of the solution of caustic soda and applied it in a more or less strong form to the substance.

95 X Q. 141. Was that made by you?

A. No, sir.

X Q. 142. Do you know what the solution was; do you know what there was in the caustic-soda solution—what the substances were?

A. All caustic soda is made from lime water and soda.

X Q. 143. You used it in liquid form. I ask you if you know what the liquid substance was.

A. Water.

X Q. 144. Well, go on.

A. I think I have answered.

X Q. 145. What results did you get from that test?

A. If the soda were strong enough it would almost obliterate the substance.

X Q. 146. Did it?

A. It did; yes.

X Q. 147. Did you use it strong?

A. Yes; I used it strong and I used it weak.

X Q. 148. What did it do when you used it weak?

A. Turned it into a blueish green or a greenish blue; the substance would make a greenish blue stain on the paper.

(Counsel for defendants calls the attention of the court to the fact that this line of alleged cross-examination respecting the analysis of the complainants' paper made by this witness is not based upon the direct examination; that it is not proper cross-examination, but will be regarded as the complainants' direct evidence on that point.)

(Complainants' counsel responds that he apprehends that the matter is proper subject for cross-examination, since the witness has given on cross-examination as the source of his knowledge
96 the existance of specimens that he believes to have been made by the complainants, and his analyses of these specimens discover what they contain.)

X Q. 149. Did you preserve any record of your examination of those papers?

A. No, sir.

X Q. 150. Did you preserve any of the pieces of paper or parts of the sheets upon which you had experimented?

A. No, sir.

X Q. 151. Did you call the attention of Mr. Underwood to the fact that you was making or had been making such examination?

A. No, sir; I don't remember of speaking to him about it.

X Q. 152. Who did you tell it to about that time, if anybody?

A. I have mentioned frequently to people who have been in the office that Mr. Underwood's paper was made from a precipitate of dye-wood matter.

X Q. 153. Who did you say it to as long ago as 1884? Name one person.

A. Oh, I couldn't recall that; I haven't a particle of doubt if I was to advertise I could get a dozen of them.

X Q. 154. Can you name such a person?

A. I can't recall one; no, sir; the discussion has come up in some way when Mr. Underwood's paper has been referred to in my office.

X Q. 155. You never talked of such matters outside?

A. Very seldom. I am glad to forget business when I get away from it.

STEPHEN T. SMITH.

Subscribed and sworn to before me—

HENRY L. BRANT,
Special Examiner.

97 Counsel for defendants, in order to illustrate the state of the art, offers in evidence the Scientific American of August 12, 1876, being vol. 35, No. 7, and more particularly the article on page 101 thereof, entitled "Logwood Inks," which article is in terms as follows:

"Logwood Inks."

"Logwood inks have been much employed for several years on account of their cheapness and the beauty of their tint. The greater part of the so-called copying inks are prepared at the present time from this coloring matter. Both the raspel logwood and the commercial extract are subject to falsifications. It is well therefore to make use of the whole logwood and rasp or grind it as required. It is necessary also to consider the presence of an excess of moisture and of foreign substances which may be used to adulterate it as insoluble substances, cutch, etc.

"The inks prepared from logwood are of four classes: 1, inks with logwood and chrome; 2, inks with logwood and alum; 3, inks with logwood and copper; 4, inks with logwood and iron.

"Runge in 1848 discovered that a dilute solution of the coloring matter of logwood, to which has been added a small quantity of neutral chromate of potassium, produces a deep black liquid which remains clear, does not deposit, and may be employed as ink. Perfectly neutral litmus paper is not affected by it; it does not attack pens; it is very cheap and so easily penetrates writing paper that it cannot be removed by washing even with a sponge; in a word, it has all the properties of an excellent ink. On exposure to the air in the inkstand it sometimes decomposes very rapidly, its coloring matter being deposited in the form of large black flakes which leaves a colorless liquid above them. This gelatinization is a great
98 defect in this ink, particularly as one does not know the precise conditions which determine it. Different means have been proposed to prevent this action; the best seems to be that of the addition of corbonate of sodium recommended by Bottger.

"The author has used an ink prepared in this manner for upwards of two years and has not observed any decomposition, although this may be to a considerable extent due to the fact that the inkstand employed was one which allowed but little exposure to air.

"To prepare this ink take extract of logwood, 15 parts; water, 1,000 parts; crystallized carbonate of sodium, 4 parts; neutral chromate of potassium, 1 part.

"Dissolve the extract of logwood in 900 parts of water, allow it to deposit, decant, heat to ebullition, and add the carbonate of soda; lastly add, drop by drop, with constant stirring a solution of the neutral chromate in 100 parts water. The ink thus obtained has a fine bluish black color; it flows well from the pen and dries readily. The chrome ink powder of Platzer and the acid ink of Pancelet are imitations of the original ink of Runge.

"An ink obtained from a decoction of logwood and chrome alum is not to be recommended; the characters written with it have little depth of color, and are of a somewhat grayish shade.

"Decoctions of logwood to which alum has been added give a reddish or violet color which darkens slowly, particularly with ink prepared from the wood and not the extract. Such inks prepared with alum are costly, because to obtain a sufficiently deep tint one is obliged to employ decoctions or solutions of the extract in a very concentrated condition. It is otherwise when a metallic salt is added along with the alum. Alum produces a reddish purple color in decoctions of logwood, while metallic salts produce in the oxidized solution of the coloring matter a precipitate of a black or bluish-black color. These inks are analogous to the so-called alizarine inks; the ink is colored by the tint produced by the alum. Under the influence of air there is produced between the metallic salts and the color-
99 ing matter a reaction which determines the formation of a bluish-black precipitate. To prevent as much as possible this action of the air upon the ink before it is applied to the paper there is added, as in the case of alizarine inks, a trace of sulphuric acid, de-

signed to dissolve the precipitate which may be produced. This acidity of the ink has several disadvantages; it attacks the pens used for writing with it unless they are either of gold, platinum, or gutta-percha. Sulphate of copper or sulphate of iron may be the metallic salt used in such inks; the former is preferable. One of the best formulas for this kind of ink is the following, given in proportions for a manufacturing scale: 20 parts, by weight, of extract of logwood are dissolved in 200 parts of water and the solution clarified by the subsidence and decantation. A yellowish brown liquid is thus obtained. In another vessel 10 parts of ammonia alum are dissolved in 20 parts of boiling water; the two solutions are mixed, there being also added $\frac{1}{5}$ part of sulphuric acid, and finally $1\frac{1}{2}$ parts of sulphate of copper. The ink should be exposed to the air for a few days to give a good color, after which it should be stored in well-corked bottles.

"Bottger gives the following formula: 30 parts of extract of logwood are dissolved in 250 parts of water; 8 parts of crystallized carbonate of soda and 30 parts of glycerine of density 1.25 are added; and, lastly, 1 part of yellowish chromate of potassium and 8 parts of gum arabic, reduced to a powder and dissolved in several parts of water. This ink does not attack pens, does not mold, and is very black.—E. U. Viedt."

For the like purpose counsel for defendants offers in evidence from vol. 1 of Ure's Dictionary of Arts, Manufactures, and Mines, published New York, Appleton & Co., 1866, the article entitled "Dyeing," beginning on page 601 and ending on page 612 of said volume, and reads part as follows:

100 "Dying (*Teinture*, Fr.; *Farberei*, Germ.) is the art of impregnating wool, silk, cotton, linen, hair, and skins with colors not removable by washing or the ordinary usage to which these fibrous bodies are exposed when worked up into articles of furniture or raiment. I shall here consider the general principles of the art, referring for the particular dies and peculiar treatment of the stuffs to be dyed to the different tinctorial substances in their alphabetical places, such as cochineal, indigo, madder, &c.

"Dyeing is altogether a chemical process, and requires for its due explanation and practice an acquaintance with the properties of the elementary bodies and the laws which regulate their combinations. It is true that many operations of this as of other chemical arts have been practised from the most ancient times, long before any just views were entertained of the nature of the changes that took place. Mankind, equally in the rudest and most refined state, have always sought to gratify the love of distinction by staining their dress, sometimes even their skin, with gaudy colors. Moses speaks of raiment dyed blue and purple and scarlet and of sheep skins dyed red, circumstances which indicate no small degree of tinctorial skill. He enjoins purple stuffs for the works of the tabernacle and the vestments of the high priests.

"In the article calico printing I have shown from Pliny that the ancient Egyptians cultivated that art with some degree of scientific

precision, since they knew the use of mordants or those substances which, though they may impart no color themselves, yet enable white robes (*candida vela*) to absolve coloring drugs (*colorem sorbendibus medciamentis*). Tyre, however, was the nation of antiquity which made dying its chief occupation and the staple of its commerce. There is little doubt that purple, the sacred symbol of royal and sacredotal dignity, was a color discovered in that city, and that it contributed to its opulence and grandeur. Homer marks no less the value than the antiquity of this dye by describing
101 his heroes as arrayed in purple robes. Purple habits are mentioned among the presents made to Gideon by the Israelites from the spoils of the kings of Midian.

"The juice employed for communicating this dye was obtained from two different kinds of shell-fish described by Pliny under the names of *purpura* and *buccinum* and was extracted from a small vessel or sac in their throats to the amount of only one drop from each animal. A darker and inferior color was also procured by crushing the whole substance of the *buccinum*. A certain quantity of the juice collected from a vast number of shells, being treated with sea salt, was allowed to ripen for three days, after which it was diluted with five times its bulk of water, kept at a moderate heat for six days more, occasionally skimmed to separate the animal membranes, and when thus clarified was applied directly as a dye to white wool, previously prepared for this purpose by the action of lime water or of a species of lichen called fucus. Two operations were requisite to communicate the finest Tyrian purple; the first consisted in plunging the wool into the juice of the purpura; the second into that of the buccinum. Fifty drachms of wool required one hundred of the former liquor and two hundred of the latter. Sometimes a preliminary tint was given with coccus, the kermes of the present day, and the cloth received merely a finish from the precious animal juice. The colors, though probably not nearly so brilliant as those producible by our cochineal, seem to have been very durable, for Plutarch says, in his life of Alexander (chap. 36), that the Greeks found in the treasury of the King of Persia a large quantity of purple cloth which was as beautiful as at first, though it was 190 years old.

"The difficulty of collecting the purple juice and the tedious complication of the dyeing process made the purple wool of Tyre so expensive at Rome that in the time of Augustus a pound of it cost nearly $300 of our money. Notwithstanding this enormous price, such was the wealth accumulated in the capital that
102 many of the leading citizens decorated themselves in purple attire till the emperors arrogated to themselves the privileges of wearing purple and prohibited its use to every other person. This prohibition operated so much to discourage this curious art as eventually to occasion its extinction first in the western and then in the eastern empire, where, however, it existed in certain imperial manufactories till the eleventh century.

"Dyeing was little cultivated in ancient Greece. The people of Athens wore generally woolen dresses of the natural color, but the

Romans must have bestowed some pains upon this art. In the games of the circus parties were distinguished by colors. Four of these are described by Pliny—the green, the orange, the gray, and the white. The following ingredients were used by their dyers: A cruid native alum mixed with copperas, copperas itself, blue vitrol, alkanet, lichen rocellus or archil, broom, madder, wood, nut-galls, the seed of pomegra-te, and of an Egyptian acacia.

"Gage, Cole, Plumier, Reaumur, and Duhamel have severally made researches concerning the coloring juices of shell-fish caught on various shores of the ocean and have succeeded in forming a purple dye, but they found it much inferior to that furnished by other means. The juice of the buccinum is at first white. It becomes by exposure to the air of a yellowish green bordering on blue. It afterwards reddens and finally changes to a deep purple of considerable vivacity. These circumstances coincide with the minute description of the manner of catching the purple-dye shell-fish, which we possess in the work of an eye-witness, Eudocia Macrembolitissa, daughter of the Emperor Constantine VIII, who lived in the eleventh century.

"The moderns have obtained from the new world several dye-drugs unknown to the ancients, such as cochineal, quercitron, Brazil wood, logwood, annatto, and they have discovered the art of using indigo as a dye, which the Romans knew only as a pigment; but the vast superiority of our dyes over those of former times must
103 be ascribed principally to the employment of pure alum and solution of tin as mordants, either alone or mixed with other bases, substances which give to our common dyestuffs remarkable depth, durability, and lustre. Another improvement in dyeing of more recent date is the application to textile substances of metallic compounds, such as Prussian blue, chrome yellow, manganese brown, &c.

"Indigo, the innoxious and beautiful product of an interesting tribe of tropical plants, which is adapted to form the most useful and substantial of all dyes, was actually denounced as a dangerous drug and forbidden to be used by our parliament in the reign of Queen Elizabeth. An act was passed authorizing searchers to burn both it and logwood in every dye-house where they could be found. This act remained in full force till the time of Charles II.—that is, for a great part of a century. A foreigner might have supposed that the legislators of Engald entertained such an affection for their native woad, with which their naked sires used to dye their skins in the old times, that they would allow no outlandish drug to come in competition with it. A most instructive book might be written illustrative of the evils inflicted upon arts, manufactures, and commerce in consequence of the ignorance of the legislature.

"Colors are not, properly speaking, materiel. They are impressions which we receive from the rays of light reflected, in a decomposed state, by the surfaces of bodies. It is well known that a white sunbeam consists of an indeterminate number of differently colored rays, which, being separated by the refractive force of a glass prism from the solar spectrum, an image distinguishable into seven sorts

of rays—the red, orange, yellow, green, blue, indigo, and violet; hence, when an opaque body appears colored—for example, red—we say that it reflects the red rays only, or in greatest abundance, mixed with more or less of the white beam, which has escaped decomposition. According to this manner of viewing the coloring principle the art of dyeing consists in fixing upon stuffs, by
104 means of corpuscular attraction, substances which act upon light in a different manner from the surfaces of the stuff themselves. The dyer ought, therefore, to be familiar with two principles of optics—the first relative to the mixture of colors and the second to their simultaneous contrast.

"Whenever the different colored rays which have been separated by the prism are totally reunited they produce white light. It is evident that in this composition of light, if some rays were left out, or if the colored rays be not in a certain proportion, we should not have white light but light of a certain color. For example, if we separate the red rays from the light decomposed by a prism, the remaining colored rays will form, by their combination, a peculiar bluish green. If we separate in like manner the orange rays the remaining colored rays will form, by their combination, a blue color. If we separate from the decomposed prismatic light the rays of greenish yellow the remaining colored rays will form a violet, and if we separate the rays of yellow bordering on orange the remaining colored rays will form, by their union, an indigo color.

"Thus we see that every colored light has such a relation with another colored light that, by uniting the first with the second, we reproduce white light, a relation which we express by saying that the one is the complement of the other. In this sense red is the complementary color of bluish green; orange, of blue; greenish yellow, of violet, and orange yellow, of indigo. If we mix the yellow ray with the red we reproduce orange; the blue gray with the yellow we produce green, and the blue with the red we produce violet or indigo, according as there is more or less red relatively to the blue; but these tints are distinguishable from the orange, green, indigo, and violet of the solar spectrum, because when viewed through the prism they are reduced to their elementary compound colors.

"If the dyer tries to realize the preceding results by the mixture of dyes he will succeed only with a certain number of them.
105 Thus, with red and yellow he can make orange; with blue and yellow, green; with blue and red, indigo or violet. These facts, the results of practice, have led him to conclude that there are only three primitive colors, the red, yellow, and blue. If he attempts to make a white by applying red, yellow, and blue dyes in certain quantities to a white stuff, in imitation of the philosopher's experiment on the synthesis of the sunbeam, far from succeeding, he will deviate still further from his purpose, since the stuff will, by these dyes, become so dark colored as to appear black.

"The fact must not, however, lead us to suppose that in every case where red, yellow, and blue are applied to white cloth black is produced. In reality, when a little ultramarine, cobalt blue, Prus-

sian blue, or indigo is applied to goods with a view of giving them the best possible white, if only a certain proportion be used the goods will appear whiter after this addition than before it. What happens in this case? The violet blue forms with the brown yellow of the goods a mixture tending to white, or less colored than the yellow of the goods and the blue together were. For the same reason a mixture of Prussian blue and cochineal pink has been of late years used in the whitening of the azuring of silks in preference to pure blue; for on examining closely the color of the silk to be neutralized it was found by the relations of the complementary colors that the violet was more suitable than the indigo blue formerly used. The dyer should know that when he applies several different coloring matters to stuffs, as yellow and blue, for example, if they appear green it is because the eye cannot distinguish the points which reflect the yellow from those which reflect the blue, and that consequently it is only where the distinction is not possible that a mixture or combination appears. When we examine certain grey substances, such as hairs, feathers, &c., with the microscope we see that the grey color results from black points disseminated over a colorless or slightly colored surface. In reference to compound colors, this instrument might be used with advantage by the dyer.

106 "The dyer should be acquainted also with the law of the simultaneous contrast of colors. When the eye views two colors close alongside of each other it sees them differing most in their optical composition and in the height of their tone when the two are not equally pale or full-bodied. They appear most different as to their optical composition when the complementary of the one of them is added to the color of the other. Thus, put a green zone alongside of an orange zone, the red color complementary of green being added to the orange will make it appear redder; and in like manner the blue, complementary of orange, being added to the green, will make it appear more intensely blue. In order to appreciate these differences, let us take two green stripes and two orange stripes, placing one of the green stripes near one of the orange, then place the two others so that the green stripe may be at a distance from the other green stripe, but on the same side, and the orange at a distance from the other orange, also on the same side.

"As to contrast in the height of the tone, we may satisfy ourselves by taking the tones No. 1, No. 2, No. 15, and No. 16 from the graduated pallet of reds; for example, by placing No. 2 and No. 15 close alongside, putting No. 1 at a distance from No. 2, on the same side, and No. 15 at a distance from No. 15, on the same side, we shall see (if the pallet is sufficiently lowered in tone) No. 2 equal to No. 1, and No. 16 equal to No. 16; whence it follows that No. 2, by the vicinity of No. 15, will appear to have lost some of its color, while No. 15 will appear to have acquired color. When black or gray figures are printed upon colored grounds these figures are of the color complimentary of the ground; consequently, in order to judge of the color, we must cut out spaces in a piece of gray or white paper, so as to al-

low the eye to see nothing but the figures; and if we wish to compare figures of the same color, applied upon grounds of different colors, we can judge rightly of the figures only by insulating them from the grounds.

107 "The relations of dyeing with the principles of chemistry constitute the theory of the art, properly speaking; this theory has for its basis the knowledge, 1, of the species of bodies which dyeing processes bring into contact; 2, of the circumstances in which these species act; 3, of the phenomena which appear during their action, and, 4, of the properties of the colored combinations which are produced. These generalities may be specified under the ten following heads:

"1. The preparation of the stuffs to be dyed, whether fibres, yarn, or cloth, under the heads of ligneous matter, cotton, hemp, flax, and of the animal matters, silk and wool.

"2. The mutual action of these stuffs and simple bodies.

"3. The mutual action of these stuffs and acids.

"4. The mutual action of these stuffs and salifiable bases, as alumina, &c.

"5. The mutual action of these stuffs and salts.

"6. The mutual action of these stuffs and neutral compounds, not saline.

"7. The mutual action of these stuffs and of one or more definite compounds.

"8. Of dyed stuffs, considered in reference to the fastness of their color under the influence of heat, light, water, oxygen, air, boilings with soap, and reagents.

"9. Of dyeing, considered with its connections with chemistry.

"10. Of dyeing, considered in its relations with calorie, mechanics, hydraulics, and optics.

"1. The preparation of stuffs:

"The operations to which stuffs are subjected before dyeing are intended, 1, to separate from them any foreign matters; 2, to render them more apt to unite with the coloring tinctures which the dyer proposes to fix upon them in order to give them a more agreeable or more brilliant aspect or to lessen their tendency to assume a soiled appearance by use, which white surfaces so readily do. The foreign

108 matters are either naturally inherent in the stuffs or added to them in the spinning, weaving, or other manipulation of manufacture. The ligneous fibres must be freed from the colored azotized varnish on the surface, from a yellow coloring matter in their substance, from some lime and iron, from chlorophylle or leaf green, and from pectic acid, all natural combinations. Some of these principles require to be oxygenized before alkaline leys can cleanse them, as I have stated in the article Bleaching, which may be consulted in reference to this subject. See also Silk and Wool. A weak bath of soda has the property of preparing wool for taking on a uniform dye, but it must be well rinsed and aired before being put in the dye vat.

"2. Mutual action of stuffs and simple bodies·

"Stuffs, chemically considered, being composed of three or four

elements already in a state of reciprocal saturation, have but a feeble attraction for simple substances. We know, in fact, that the latter combine only with each other or with binary compounds, and that in the greater number of cases where they exert an action upon more complete compounds it is by disturbing the arrangement of their elements and not by a resulting affinity with the whole together.

"3, 4. Although stuffs may in a general point of view be considered as neutral in relation to coloring reagents, yet experience shows that they are more disposed to combine with acid than with alkaline compounds, and that consequently their nature seems to be more alkaline than acid. By steeping dry wool or other stuff in a clean state in an alkaline or acid solution of known strength and by testing the liquor after the stuff is taken out we shall ascertain whether there be any real affinity between them by the solution being rendered more dilute in consequence of the abstraction of alkaline or acid particles from it. Wool and silk thus im-ersed abstract a portion of both sulphuric and muriatic acids, but cotton and flax imbibe the water, with the rejection of a portion of the acid. The acid may again be taken from the stuffs by washing them with a sufficient quantity of water.

"5. The affinity between saline bodies and stuffs may be
109 ascertained in the same way as that of acids by plunging the dry stuffs into solutions of the salts and determining the density of the solution before the immersion and after withdrawing the stuffs. Wool abstracts alum from its solution, but it gives it all out again to boiling water. The sulphates of protoxyde of iron, of copper and zinc resemble alum in this respect. When silk is steeped for some time in solution of protosulphate of iron it abstracts the oxyde, gets thereby dyed, and leaves the solution acidulous. Wool put in contact with cream of tartar decomposes a portion of it; it absorbs the acid into its pores and leaves a neutral salt in the liquor. The study of the action of salts upon stuffs is at the present day the foundation of the theory of dyeing, and some of them are employed immediately as dye-drugs.

"6. Mutual action of stuffs and neutral compounds not saline:

"Several sulphurets, such as those of arsenic, lead, copper, antimony, and tin, are susceptible of being applied to stuffs and of dyeing them in a more or less fast manner. Indigo, hematine, breziline, carmine, and the peculiar coloring principles of many dyes belong to this division.

"7. Mutual action of goods with one or more definite compounds and dyestuffs:

"I shall consider here, in a theoretical point of view, the most general results which a certain number of organic coloring matters present when applied upon stuffs by the dyer.

"Indigo.—This dye-drug, when tolerably good, contains half its weight of indigotine. The cold vat is prepared commonly with water, copperas, indigo, lime, or sometimes carbonate of soda, and is used almost exclusively for cotton and linen. Immersion in acidulated water is occasionally had recourse to for removing a

little oxyde of iron which attaches itself to the cloth dyed in this vat.

"The indigo vat for wool and silk is mounted exclusively with indigo, good potashes of commerce, madder, and bran. In
110 this vat the immediate principles, with base of carbon and hydrogen, such as the extracts of madder and bran, perform the disoxydizing function of the copperas in the cold vat. The pastal vats require most skill and experience in consequence of their complexity. The greatest difficulty occurs in keeping them in good condition, because they vary progressively as the dyeing goes on, by the abstraction of the indigotine and the modification of the fermentable matter employed to disoxygenate the indigo. The alkaline matter also changes by the action of the air. By the successive ad-itions of indigo, alkali, &c., this vat becomes very difficult to manage with profit and success. The great affair of the dye is the proper addition of lime, too much or too little being equally injurious.

"Sulphate of indigo or Saxon blue is used also to dye silk and wool. If the wools be ill sorted it will show their difference by the inequalities of the dye. Wool dyed in this bath put into water saturated with sulphureted hydrogen becomes soon colorless, owing to the disoxygenation of the indigo. The woolen cloth, when exposed to the air for some time, resumes its blue color, but not so intensely as before.

"The properties of hematine explain the mode of using logwood. When stuffs are dyed in the infusion or decoction of this wood, under the influence of a base which acts upon the hematine in the manner of an alkali, a blue dye, bordering upon violet, is obtained. Such is the process for dyeing cotton and wool a logwood blue by means of verdigris, crystallized acetate of copper, and acetate of alumina.

"When we dye a stuff yellow, red, or orange we have always bright tints; with blue we may have a very dark shade, but somewhat violet; the proper black can be obtained only by using the three colors, blue, red, and yellow, in proper proportions. Hence we can explain how the tints of yellow, red, orange, blue, green, and violet may be browned by applying to them one or two colors, which, along with themselves, will produce black; and also
111 we may explain the nature of that variety of blacks and grays which seem to be indefinite. Nut-galls and sulphate of iron, so frequently employed for the black dye, give only a violet or bluish gray. The pyrolignite of iron, which contains a brown empyreumatic matter, gives to stuffs a brown tint, bordering upon greenish yellow in the pale hues and to chestnut brown in the dark ones. By galling cotton and silk and giving them a bath of pyrolignite of iron we may, after some alterations, dye them black. Galls, logwood, and salt of iron produce merely a very deep violet blue, but by boiling and exposure to air the hematate of iron is changed, becoming red brown, and favors the production of black; galls and salts of copper dye stuffs an olive drab, logwood and salts of copper a violet blue; hence their combination should produce a black. In using

sumach as a substitute for galls we should take into account the proportion of yellow matter it contains. When the best possible black is wanted upon wool we must give the stuff a foundation of indigo, then pass it into a bath of logwood, sumach, and protosulphate of iron. The sumach may be replaced by one-third of its weight of nut-galls.

"8. Of dyed stuffs considered in reference to the fastness of their colors, when exposed to water, light, heat, air, oxygen, boiling, and reagents:

"Pure water without air has no action upon any properly dyed stuff.

"Heat favors the action of certain oxygenized bodies upon the carbonaceous and hydrogenous constituents of the stuff, as is seen with regard to chromic acid and peroxyde of manganese upon cotton goods. It promotes the solvent action of water and it even effects some colors. Thus Prussian blue applied to silk is reduced to peroxyde of iron by long boiling.

"Light without contact of air effects very few dyes. Oxygen, especially in the nascent state, is very powerful upon dyes.

"See bleaching.

112 "The atmosphere in a somewhat moist state effects many dyes at an elevated temperature. Silk dyed pink with safflower, when heated to 400° F., becomes of a dirty white hue in the course of an hour. The violet of logwood upon alumed wool becomes of a dull brown at the same temperature in the same time, but both stand a heat of 300° F. Brazil red dye, turmeric, and weld yellow dyes display the same phenomena. These facts show the great fixity of colors commonly deemed tender. The stuffs become affected to a certain degree under the same circumstances as the dyes. The alterability even of indigo in the air is shown in the wearing of pale blue clothes; in the dark blue cloth there is such a body of color that it resists proportionally longer, but the seems of coats exhibit the effect very distinctly. In silk window curtains which have been long exposed to the air and light the stuff is found to be decomposed as well as the color.

"Boiling was formerly prescribed in France as a test of fast dyes. It consisted in putting a sample of the dyed goods in boiling water, holding in solution a determinate quantity of alum, tartar, soap, and vinegar, &c. Dufay improved that barbarous test. He considered that fast-dyed cloth could be recognised by resisting an exposure of twelve hours to the sunshine of summer and to the midnight dews, or of sixteen days in winter.

"In trying the stability of dyes we may offer the following rules:

"That every stuff should be exposed to the light and air. If it be intended to be worn abroad it should be exposed also to the wind and rain; that carpets, moreover, should be subjected to friction and pulling to prove their tenacity, and that cloths to be washed should be exposed to the action of hot water and soap.

"In examining a piece of dyed cotton goods we may proceed as follows:

"Suppose its color to be orange brown. We find first that it im-

parts no color to the boiling water; that protochloride of tin
113 takes out its color; that plunged into a solution of ferroprussiate of potash it becomes blue, and that a piece of it being burned leaves a residuum of peroxyde of iron; we may thence conclude that the dyeing matter is peroxyde of iron.

"Suppose we have a blue stuff which may have been dyed either with indigo or with Prussian blue and we wish to know what it will become in use, we inquire first into the nature of the blue. Hot water slightly alkaline will be colored blue by it if it has been dyed with sulphate of indigo. It will not be colored if it was dyed in the indigo vat, but will become yellow by nitric acid. Boiling water, without becoming colored itself, will destroy the Prussian blue dye. An alkaline water will convert its color into an iron-rust tint; nitric acid, which makes the indigo dye yellow, makes that of Prussian blue green. The liquor resulting from boiling alkaline water on the Prussian blue cloth will convert sulphate of iron into Prussian blue.

"9 division. Of dyeing viewed in its relation to chemistry:

"The phenomena of dyeing have been ascribed to very different causes. By some they were supposed to depend upon mechanical causes and by others upon the forces from which chemical effects flow. Hellot, in conformity with the first mode of explanation, thought that the art of dyeing consisted essentially in opening the pores in order to admit coloring matters into them and to fix them there by cooling or by means of a mordant imagined to act like a cement.

"Dufay in 1737, Bergmann in 1776, Macquer in 1778, and Berthollet in 1790 had recourse to chemical affinities to explain the fixation of the coloring principles upon stuff, either without an intermedium like indigo, walnut peels, annotto, or by the intervention of an acid, a salifiable base, or a salt, which were called mordants. When bodies present phenomena which we refer to an attraction uniting particles of the same nature, whether simple or compound, to form an aggregate, or to an affinity which unites the par-
114 ticles of different natures to form them into a chemical compound these bodies are in apparent contact. This happens precisely in all the cases of the mutual action of bodies in an operation of dyeing. If their particles were not in apparent contact there would be absolutely no change in their respective condition. When we see stuffs and metallic oxydes in apparent contact form a mutual union of greater or less force we cannot, therefore, help referring it to affinity. We do not know how many dyes may be fixed upon the same piece of cloth, but in the operations of the dyehouse sufficiently complex compounds are formed, since they are always stuffs composed of three or four elements which are combined with at least binary acid or bastic compounds, with simple salts compounded themselves of two immediate principles at least binary, with double salts composed of two simple salts, and finally with organic dyestuffs containing three or four different elements. We may add that different species belonging to one of these classes and different species belonging to different classes may unite simul-

taneously with one stuff. The union of stuffs with coloring matters appears in general not to take place in definite proportions, though there are probably some exceptions.

"We may conclude this head by remarking that besides the stuff and the coloring matter it is not necessary in dyeing to distinguish a third body under the name of mordant, for the idea of mordant does not rest upon any definite fact, the body to which this name has been given being essentially only one of the immediate principles of the colored combination which we wish to fix upon the stuff.

"10 division. Of dyeing in its relation with caloric, mechanics, hydraulics, pneumatics, and optics:

"Dyeing baths or coppers are heated directly by a furnace or by means of steam conducted in a pipe from a boiler at a certain distance from the bath. In the first case the vessels are almost always made of copper; only in special cases for the scarlet and
115 some delicate silk dies of tint; in the second place they are of copper, iron, or wood. A direct fire is more economical than heating steam pipes, where there is only one or two baths to heat or where the labors are often suspended. Madder and indigo vats when heated by steam have it either admitted directly into the liquor or made to circulate through pipes plunged into it or between the copper and an exterior iron or wood case. See the end of this article.

"Everything else being equal, dyeing with heat presents fewer difficulties towards obtaining an evenly color than dyeing in the cold; the reason for which may be found in the following facts: The air adhering to the surface of stuffs and that interposed between the fibres of their constituent yarns is more easily extricated in a hot bath than a cold one, and thus allows the dye liquor to penetrate more easily into the interior; in the second place, the currents which take place in a hot bath and which tend incessantly to render its contents uniform by renewing continually the strata of liquid in contact with the stuff contribute mainly to render the dyeing evenly. In cold dyeing it is necessary to stir up the bath from time to time; and when goods are first put in they must be carefully dipped, then taken out, pressed, and wrung several times in succession till they be uniformly moistened.

"The mechanical relations are to be found in the apparatus employed for wincing, siring, and pressing the goods, as we have described under calico printing and bandana. The hydraulic relations refer to the wash wheels and other similar apparatus, of which an account is given under the same articles. The optical relations have been already considered. In the sequel of this article an automatic dyeing vat will be described.

"The extracts of solutions of native dyestuffs may be divided into two classes in reference to their habitudes with the oxygen of the atmosphere, such as continue essentially unaltered in the air and such as suffer oxydation, and thereby precipitate a de-
116 terminate coloring matter. The dyes contained in the watery infusions of the different vegetable and animal substances which do not belong to the second class are feebly attached to their

solvents and quit them readily for any other bodies that possess an attraction for them. On this principle a decoction of cochineal, logwood, Brazil wood, or a solution of sulphate of indigo by digestion with powdered bone black lose their color in consequence of the coloring particles combining by a kind of capillary attraction with the porous carbon without undergoing any change. The same thing happens when well-scoured wool is steeped in such colored liquids, and the color which the wool assumes by its attraction for the dye is, with regard to most of the above colored solutions, but feeble and fugitive, since the dye may be again abstracted by copious washing with simple water, whose attractive force therefore overcomes that of the wool. The aid of a high temperature, indeed, is requisite for the abstraction of the color from the wool and the bone black, probably by enlarging the size of the pores and increasing the solvent power of the water.

"Those dye-baths, on the contrary, whose coloring matter is of the nature of extractive or apotheme, form a faster combination with stuffs. Thus the yellow, fawn, and brown dyes which contain tannin and extractive become oxygenated by contact of air and insoluble in water; by which means they can impart a durable dye. When wood is impregnated with decoctions of that kind its pores get charged by capillarity, and when the liquid becomes oxygenated they remain filled with a color now become insoluble in water. A similar change to insolubility ensues when the yellow liquor of the indigo vat gets oxydized in the pores of cotton and wool, into which it had been introduced in a fluid state. The same change occurs when protosulphate of iron is converted into persulphate, with the deposition of an insoluble peroxyde in the substance of the stuff. The change here effected by oxydation can, in other circumstances, be produced by acids which have the power of precipitating
117 the dyestuff in an insoluble state, as happens with decoction of fustic.

"Hence we perceive that the dyeing of fast colors rests upon the principle that the colors dissolved in the vat during their union with the stuff should suffer such a change as to become insoluble in their former menstrum. The more this dye, as altered in its union with the stuff, can resist other menstrua or agents the faster it will be. This is the essential difference between dyeing and painting, or applying a coat of pigment devoid of any true affinity for the surface.

"If we mix a clear infusion of a dye with a small quantity of a solution of an earthly or metallic salt, both in water, the limpid liquids soon become turbid, and there gradually subsides, sooner or later, according to the nature of the mixture, a colored precipitate consisting of the altered dye united with a basic or subsalt. In this compound the coloring matter seems to act the part of an acid, which is saturated by a small quantity of the basis, or in its acid relationship is feeble, so that it can also combine with acids, being in reference to them a base. The decomposition of a salt, as alum, by dyes is effected principally through the formation of an insoluble subsalt with which the color combines, while a supersalt remains in

the bath and modifies by its solvent reaction the shade of the dyed stuff. Dyed stuffs may be considered as composed of the fibrous body intimately associated with the coloring matter, the oxide, and acid, all three constituting a compound salt. Many persons have erroneously imagined that dyed goods contained none of the acid employed in the dye bath, but they forget that even potash added to alum does not throw down the pure earthy basis, but a subsalt, and they should not ascribe to coloring matter a power of decomposition at all approaching to that of an alkali. Salts containing strong acids saturate a very large quantity of coloring matter in proportion to their place in the scale of chemical equivalents. Mere bases, such as pure alu-
118 mina and pure oxide of tin, have no power of precipitating coloring matter, When they seem to do so they always contain some acid.

"Such salts, therefore, as have a tendency to pass readily into the basic state are peculiarly adapted to act as mordants in dyeing and to form colored lakes. Magnesia affords as fine a white powder as alumina and answers equally well to dilute lakes, but its soluble salts cannot be employed to form lakes because they do not pass into the basic state. This illustration is calculated to throw much light upon dyeing processes in general.

"The color of the lake depends very much upon the nature of the acid and the basis of the precipitating salt. If it be white, like alumina and oxyde of tin, the lake will have, more or less, the color of the dye, but brightened by the reflection of white light from the basis, while the difference of the acid occasions a difference in the hue. The colored bases impart more or less of their color to the lakes, not merely in virtue of their own tints, but of their chemical action upon the dye.

"Upon these principles a crimson precipitate is obtained from infusions of cochineal by alum and salt of tin, which becomes scarlet by the addition of tartar; by acetate of lead a violet-blue precipitate is obtained, which is durable in the air; by muriate of lime a pink brown precipitate falls, which soon becomes black and at last dirty green; by the solution of a ferruginous salt the precipitates are dark violet and black, and in like manner all other salts with earthy or metallic bases afford diversities of shade with cochineal. If this dye-stuff be dissolved in weak water of ammonia and be precipitated with acetate of lead a green lake is obtained, which after some time will become green on the surface by contact of air, but violet and blue beneath. Hence it appears that the shade of color of a lake depends upon the degree of oxydation or change of the color caused by the acid of the precipitating salt upon the degree of oxydation or color of the oxyde which enters into union with the dye and upon its quantity in reference to that of the coloring principle.

119 "Such lakes are the difficulty soluble salts which constitute the dyeing materials of stuffs. Their particles, however, for the purposes of dyeing must exist in a state of extremely fine division in the bath liquor in order that they may penetrate along with it into the minute pores of textile fibres and fill the cavities observed by means of the micro-pe in the filaments of wool, silk, cotton, and

flax. I have examined these stuffs with an achromatic microscope, and find that when they are properly dyed with fast colors the interior of their tubular texture is filled or lined, at least, with coloring matter. When the bath contains the coloring particles so finely divided that they can pass through filtering paper it is capable of dyeing, but if the infusion mixed with its mordant be flocculent and and ready to subside it is unfit for the purpose. In the latter case the ingredients of the dye have already become aggregated into compounds too coherent and too gross for entering into combination with fibrous stuffs. Extractive matter and tannin are particularly liable to a change of this kind by the prolonged action of heat in the bath. Hence also an alkaline solution of a coloring matter affords no useful dye bath when mixed with the solution of a salt haveing an earthy or metallic basis.

" These circumstances, which are of frequent occurrence in the dye-house, render it necessary always to have the laky matter in a somewhat soluble condition, and to effect its precipitation within the pores of the stuffs by previously impregnating them with the saline solutions by the aid of heat, which facilitates their introductions.

" When a mordant is applied to any stuff the portion of it remaining upon the surface of the fibres should be removed, since by its combination with the coloring matter it would be apt to form an external crust of mere pigment, which would block up the pores, obstruct the entrance of the dye into the interior, and also exhaust to no purpose the dyeing power of the bath. For this reason the stuffs after the application of the mordant are drained, squeezed, washed, and sometimes (particularly with cotton and linen in calico printing) even hard dried in a hot stove.

"The saline mordants, moreover, should not in general possess the crystallizing property in any considerable degree, as this opposes their affinity of composition for the cloth. On this account the deliquescent acetates of iron and alumnia are more ready to aid the dyeing of cotton than copperas and alum.

"Alum is the great mordant employed in wool-dyeing. It is frequently dissolved in water, holding tartar equal to one-fourth the weight of the alum in solution, by which addition its tendency to crystallize is diminished and the resulting color is brightened. The alum and tartar combine with the stuff without suffering any change and are decomposed only by the action of the coloring matters in the dye bath. The alum operates solely in virtue of its sulphuric acid and earthy basis, the sulphate of potash present in that salt being rather injurious. Hence, if a sulphate of alumnia free from iron could be readily obtained it would prove a preferable mordant to alum. It is also probable for the reasons above assigned that soda alum, a salt much less apt to crystallize and to promote its tendency to pass into a basic salt, one-eighth part of its weight of potash is added to its solution or the equivalent in chalk or soda.

" We shall conclude this account of the general principles of dyeing with Mr. Delaval's observations on the nature of dyes and a list

of the different substances used in dyeing in reference to the colors produced by them.

"Sir Isaac Newton supposed colored matters to reflect the rays of light, some bodies reflecting the more, others the less, refrangible rays the most copiously, and this he conceived to be the true and the only reason of their colors. Mr. Delaval, however, proved, in the 2d vol. of the 'Memoirs of the Philosophical and Literary Society of Manchester,' that 'in transparent colored substances
121 the coloring substance does not reflect any light, and that when, by intercepting the light which was transmitted, it is hindered from passing through substances, they do not vary from their former color to any other color, but become entirely black,' and he instances a considerable number of colored liquors, none of them endued with reflective powers, which when seen by transmitted light appeared severally in their true colors, but all of them, when seen by incident light, appeared black, which is also the case of black cherries, black currants, blackberries, &c., the juices of which appeared red when spre-d on a white ground or otherwise viewed by transmitted instead of incident light, and he concludes that bleached linen, &c., 'when dyed or painted with vegetable colors, do not differ in their manner of acting on the rays of light from natural vegetable bodies, both yielding their colors by transmitting through the transparent colored matter the light which is reflected from the white ground,' it being apparent, from different experiments, 'that no reflecting power resides in any of their components except in their white matter only,' and that 'transparent colored substances, placed in situations by which transmission of light through them is intercepted, exhibit no color, but become entirely black.'

"The art of dyeing, therefore (according to Mr. Delaval), consists in covering white substances, from which light is strongly reflected, with transparent colored media, which, according to their several colors, transmit more or less copiously the rays reflected from the white, since the transparent media themselves reflect no light, and it is evident that if they yielded their colors by reflecting, instead of transmitting the rays, the whiteness or color of the ground on which they are applied would not in anywise alter or affect the colors which they exhibit.

"But when any opaque basis is interposed the reflection is doubtless made by it rather than by the substance of the dyed
122 wool, silk, &c., and more especially when such basis consists of the white earth of alum or the white oxyde of tin, which, by their strong reflective powers, greatly augment the lustre of colors. There are, moreover, some opaque coloring matters, particularly the acetous and other solutions of iron, used to stain linen, cotton, &c., which must necessarily themselves reflect instead of transmitting the light by which their colors are made perceptible.

"The compound or mixed colors are such as result from the combination of two differently colored dye stuffs, or from dying stuffs with one color and then with another. The simple colors of the dyer are red, yellow, blue, and black, with which, when skilfully

blended, he can produce every variety of tint. Perhaps the dun or the fawn color might be added to the above, as it is directly obtained from a great many vegetable substances.

1. Red with yellow produces orange, a color which upon wool is given usually with the spent scarlet bath. To this shade may be referred flame color, pomegranate, capuchin, prawn, jonquil, cassis, chamois, cafe au lait, aurora, marigold, orange peel, mordores, cinnamon, gold, &c. Snuff, chestnut, musk, and other shades are produced by substituting walnut peels or sumach for bright yellow. If a little blue be added to orange an olive is obtained. The only direct orange dyes are annotto and subchromate of lead. See Silk and Wool Dyeing.

"2. Red with blue produces purple, violet, lilac*h*, pigeon's neck, mallow, peach blossom, bleu de roi, lint blossom, amaranth.

"3. Red with black; brown, chocolate, marone, &c.

"4. Yellow with blue; green of a great variety of shades, such as nascent green, gay green, grass green, spring green, laurel green, sea green, celadon green, parrot green, cabbage green, apple green, duck green.

"5. Mixtures of colors three and three and four and four produce and indefinite diversity of tints; thus red, yellow, and blue
123 form brown olives and greenish grays, in which the blue dye ought always to be first given, lest the indigo vat should be soiled by other colors. Red, yellow, and gray (which is a gradation of black) give the dead-leaf tint as well as dark orange, snuff color, &c. Red, blue, and gray give a vast variety of shades, as lead gray, slate gray, wood-pigeon gray, and other colors too numerous to specify. See Brown Dye.

"The following list of dyes and the coloring substances which produce them may prove useful:

"Red. Cochineal, kermes, lac, madder, archil, carthamus or safflower, Brazil wood, logwood, periodide of mercury, alkanet.

"Yellow. Quercitron, weld, fustic (yellow wood), annotto, sawwort, dyer's broom, tuneric, fustet (*rhus cotinus*), Persian and Avignon berries (*rhammus infectorius*), willow, peroxyde of iron, chromate of lead (chrome yellow), sulphuret of arsenic, hydrosulphuret of antimony; nitric acid on silk.

"Blue. Indigo, woad, or pastel, Prussian blue, turnsole or litmus, logwood with a salt of copper.

"Black. Galls, sumach, logwood, walnut peels, and other vegetables which contain tannin and gallic acid, along with ferruginous mordants. The anacardium of India."

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Also, for the like purpose, from vol. 2 of the same dictionary, published in the same year, the article entitled "Logwood," on page 83, which article is in terms as follows:

"Logwood (*Bois de Campeche*, *Bois bleu*, Fr.; *Blauholz*, Germ.) is the wood of the *Hæmatoxylon Campechianum*, a native tree of Central America, grown in Jamaica since 1715. It was first introduced into England in the reign of Elizabeth, but as it afforded to the

unskilful dyers of her time a fugitive color, it was not only
124 prohibited from being used, under severe penalties, but was ordered to be burned wherever found by a law passed in the 23d year of her reign. The same prejudice existed and the same law was enacted against indigo. At length, after a century of absurd prohibition, these two most valuable tinctorial matters, by which all our hats and the greater part of our woolen clothes are dyed, were allowed to be used.

"Old wood with black bark and with little of the white alburnum is preferred. Logwood is denser than water, very hard, of a fine, compact grain, and almost indestructible by the atmospheric elements; it has a sweet and astringent taste and a peculiar, not offensive, smell.

"For its chemical composition see Hematin-.

"When chipped logwood is for some time exposed to the air it loses a portion of its dyeing power. Its decoction absorbs the oxygen of the atmosphere and then acquires the property of precipitation with gelatine, which it had not before. The dry extract of logwood made from an old decoction affords only a fugitive color.

"For its applications in dyeing, see black dye; brown dye; calico printing; dyeing; hat dyeing, &c.

"The imports in logwood were in 1850, 34,690 tons; in 1851, 21,240 tons, of which 3,721 tons and 3,010 tons respectively were re-exported."

Also, for the like purpose, from vol. 1 of the same publication, the article entitled "Hematine" on page 1009 of said vol., which article is in terms as follows:

"Hematine is the name given by its discoverer, Chevreul, to a crystalline substance of a pale pink color and brilliant lustre when viewed in a lens, which he extracted from logwood, the *hæmatoxylin Campechianum* of botanists. It is, in fact, the characteristic principle of this dye-wood. To procure hematine digest during a few hours ground logwood in water, heated to a temperature of about
130° Fahr.; filter the liquor, evaporate it to dryness by a
125 steam bath, and put the extract in alcohol of 0.835 for a day. Then filter anew and after having inspissated the alcoholic solution by evaporation, pour into a little water, evaporate gently again, and then leave it to itself in a cool place. In this way a considerable quantity of crystals of hematine will be obtained, which may be readily purified by washing with alcohol and drying.

"When subjected to dry distillation in a retort hematine affords all the usual products of vegetable bodies, along with a little ammonia, which proves the presence of azote. Boiling water dissolves it abundantly and assumes an orange-red color, which passes into yellow by cooling, but becomes red again with heat. Sulphurous acid destroys the colour of solution of hematine. Potash and ammonia convert into a dark purple-red tint the pale solution of hematine; when these alkalis are added in large quantity they make the color violet-blue, then brown-red, and lastly brown-yellow.

By this time the hematine has become decomposed and cannot be restored to its pristine state by neutralizing the alkalis with acids.

"The waters of baryta, strontia, and lime exercise an analogous power of decomposition, but they eventually precipitate the changed coloring matter.

"A red solution of hematine subjected to a current of sulphuretted hydrogen becomes yellow, but it resumes its original hue when the sulphureted hydrogen is removed by a little potash.

"The protoxide of lead, the protoxide of tin, the hydrate of peroxide of iron, the hydrate of oxides of copper and nickel, oxide of bismuth combine with hematine and color it blue with more or less of a violet cast.

"Hematine precipitates glue from its solution in reddish flocks. This substance has not hitherto been employed in its pure state, but as it constitutes the active principle of logwood it enters as an ingredient into all the colors made with that dye-stuff.

"These colors are principally violet and black. Chevreul has proposed hematine as an excellent test of acidity.

126 Also from the same vol. and for the like purpose the article entitled "Black Dye," on pages 178 to 182, which article is in terms as follows:

"Black dye. (*Teinte noire,* Fr.; *Schwartze ferbe,* Germ.) For 1 cwt. of cloth there are put into a boiler of middle size 18 lbs. of logwood with as much Aleppo galls in powder, and the whole, being enclosed in a bag, is boiled in a sufficient quantity of water for 12 hours. One-third of this bath is transferred into another boiler with two pounds of verdigris, and the stuff is passed through this solution, stirring it continually during two hours, taking care to keep the bath very hot without boiling. The stuff is then lifted out, another third of the bath is added to the boiler, along with 8 pounds of sulphate of iron or green vitrol. The fire is to be lowered while the sulphate dissolves, and the bath is allowed to cool for half an hour, after which the stuff is introduced and well moved about for an hour and then it is taken out to air. Lastly, the remaining third of the bath is added to the other two, taking care to squeeze the bag well. 18 or 22 lbs. of sumach are thrown in; the whole is just brought to a boil, and then refreshed with a little cold water; 2 pounds more of sulphate of iron are added, after which the stuff is turned through for an hour. It is next washed, aired, and put again into the bath, stirring it continually for an hour. After this it is carried to the river, washed well, and then fulled. Whenever the water runs off clear a bath is prepared with weld, which is made to boil for an instant, and after refreshing the bath the stuff is turned in to soften and to render the black more fast. In this manner a very beautiful black is obtained without rendering the cloth too harsh.

"Commonly more simple processes are employed. Thus the blue cloth is simply turned through a bath of gall-nuts, where it is boiled for two hours. It is next passed through a bath of logwood and

sulphate of iron for two hours, without boiling, after which
127 it is washed and fulled; but in all cases the cloth, after passing through the blue vat, should be thoroughly washed, because the least remains of its alkalinity would injur- the tone to be given to the black copper.

"Hellot has found that the dyeing might be performed in the following manner: For 20 yards of dark-blue cloth a bath is made of 2 lbs. of fustic (*morus tinctoria*), 4½ lbs. logwood, and 11 lbs. sumach. After boiling the cloth in it for three hours it is lifted out, 11 lbs. of sulphate of iron are thrown into the boiler, and the cloth is then thrown into the boiler, and the cloth is then passed through it during two hours. It is now aired and put again into the bath for an hour. It is, lastly, washed and scoured. The black is less velvety than that by the preceding process. Experience convinced him that the maddering prescribed in the ancient regulations only gives a reddish casting to the black, which is obtained finer and more velvet without madder.

"A black may be dyed likewise without having given a blue ground. This method is employed for cloths of little value. In this case they are rooted—that is to say, they receive a dun ground with walnut husks or the root of the walnut tree, and are afterward made black in the manner above described or in some other way, for it is obvious that a black may be obtained by several processes.

"According to Lewis the proportions which the English dyers most generally adopt are, for 112 lbs. of woolen cloth previously dyed of a dark blue, about 5 lbs. of sulphate of iron, as much gallnuts, and 30 lbs. of logwood. They begin by galling the cloth, they then pass it through the decoction of logwood; to which the sulphate of iron has been added.

"When the cloth is completely dyed it is washed in the river and passed through the fulling mill till the water runs off clear and colorless. Some persons recommend for fine cloths to fill them with soap water. This operation requires an expert workman who
can free the cloth thoroughly from the soap. Several
128 recommend at its coming from the fulling to pass the cloth through a bath of weld, with a view of giving softness and solidity to the black. Lewis says that passing the cloth through weld, after it has been treated with soap, is absolutely useless, although it may be beneficial when this operation has been neglected.

"The following German process is cheap and good: 100 lbs. of cloth or wool are put into the copper with sufficient water and 15 lbs. of Salzburg vitriol (potash—sulphate of iron) and 5 lbs. of argol, heating the bath gradually to boiling, while the goods are well worked about for two hours, taking them out and laying them in a cool place for twenty-four hours. They are then to be put in a lukewarm bath of from 25 lbs. to 30 lbs. of logwood and 10 lbs. of fustic, and to be worked therein while it is made to boil during two hours. The goods are now removed, and there is put into the copper 1¼ lbs. of verdigris, dissolved in vinegar; the goods are

restored into the improved bath and turned in it for half an hour, after which they are rinsed and dried.

"The process for dyeing merinos black is for 100 lbs. of them to put 10 lbs. of copperas into the bath of pure water, and to work therein for a quarter of an hour, as soon as it is tepid, one-third of the goods, then to replace that portion by the second, and after another quarter of an hour to put in the last third. Each portion is to be laid aside to air in the cold. The bath being next heated to 140° F., the merinos are to be treated as above piecemeal, but the third time it is to be passed through the bath at a boiling heat. Being now well mordanted, the goods are laid aside to air till the following day. The copper being charged with water, 50 lbs. of ground logwood, and 2 lbs. of argol, and heated, the goods are to be passed through while boiling for half an hour. They are then rinsed.

"Different operations may be distinguished in dyeing silk black—the boiling of the silk, its galling, the preparation of the bath, the operation of dyeing, the softening of the black.

129 "Silk naturally contains a substance called gum, which gives it the stiffness and elasticity peculiar to it in its native state, but this adds nothing to the strength of the silk, which is then styled raw; it rather renders it, indeed, more apt to wear out by the stiffness which it communicates, and although raw silk more readily takes a black color, yet the black is not so perfect in intensity nor does it so well resist the reagents capable of dissolving the coloring particles as silk which is scoured or deprived of its gum.

"To cleanse silk intended for black, it is usually boiled four or five hours with one-fifth of its weight of white soap, after which it is carefully beetled and washed.

"For the galling, nut-galls equal to nearly three-fourths of the weight of the silk are boiled during three or four hours, but, on account of the price of Aleppo galls, more or less of the white gall-nuts, or of even an inferior kind called galon, berry or apple galls, are used. The proportion commonly employed at Paris is two parts of Aleppo galls to from eight to ten parts of galon. After the boiling the galls are allowed to settle for about two hours. The silk is then plunged into the bath and left in it from twelve to thirty-six hours, after which it is taken out and washed in the river.

"Silk is capable of combining with quantities, more or less considerable, of the astringent principle, whence results a considerable increase of weight, not only from the weight of the astringent principle, but also from that of the coloring particles, which subsequently fix themselves in the proportion to the quantity of the astringent principle which had entered into the combination. Consequently the processes are varied according to the degree of weight which it is wished to communicate to the silk, a circumstance requiring some illustration.

"The commerce of silk goods is carried on in two ways: they are sold either by the weight or by the surface—that is, by measure.

130 Thus the trade of Tours was formerly distinguished from that of Lyons, the silks of the former being sold by weight,

those of the latter by measure. It was therefore their interest to surcharge the weight at Tours, and, on the contrary, to be sparing of the dyeing ingredients at Lyons; whence came the distinction of light black and heavy black. At present both methods of dyeing are practiced at Lyons, the two modes of sale having been adopted there.

"Silk loses nearly a fourth of its weight by a thorough boiling, and it resumes in the light black dye one-half of this loss; but in the heavy black dye it takes sometimes upwards of a fifth more than its primitive weight, a surcharge injurious to the beauty of the black and the durability of the stuff. The surcharged kind is denominated English black, because it is pretended that it was first practiced in England. Since silk dyed with a great surcharge has not a beautiful black, it is usually destined for weft and is blended with a warp dyed of fine black.

"The peculiarity of the process for obtaining the heavy black consists in leaving the silk longer in the gall liquor, in repeating the galling, in passing the silk a greater number of times through the dye, and even letting it lie in it for some time. The first galling is usually made with galls which have served for a preceding operation, and fresh gall-nuts are employed for the second. But these methods would not be sufficient for giving a great surcharge, such as is found in what is called the English black. To give it this weight the silk is galled without being ungummed, and on coming out of the galls it is rendered supple by being worked on the jack and pin.

"The silk dyers keep a black vat, and its very complex composition varies in different dye-houses. These vats are commonly established for many years, and when their black dye is exhausted it is renovated by what is called in France a brevet. When the deposit which has accumulated in it is too great it is taken out, so that at the end of a certain time nothing remains of the several in-
131 gredients which composed the primitive bath, but which are not employed in the brevet.

"For the dyeing of raw silk black it is galled in the cold with the bath of galls which has already served for the black of boiled silk. For this purpose silk in its native yellow color is made choice of. It should be remarked that when it is desired to preserve a portion of the gum of the silk, which is afterwards made flexible, the galling is given with the hot bath of gall-nuts in the ordinary manner; but here, where the whole gum of the silk and its concomitant elasticity are to be preserved, the galling is made in the cold. If the infusion of galls be weak, the silk is left in it for several days.

"Silk thus prepared and washed takes very easily the black dye, and the rinsing in a little water, to which sulphate of iron may be added, is sufficient to give it. The dye is made in the cold, but according to the greater or less strength of the rinsings it requires more or less time. Occasionally three or four days are necessary, after which it is washed, it is beetled once or twice, and it is then dried without wringing, to avoid softening it.

"Raw silk may be more quickly dyed by shaking it round the rods in the cold bath after the galling, airing it, and repeating these manipulations several times; after which it is washed and dried as above.

"Macquer describes a more simple process for the black by which velvet is dyed at Genoa, and he says that this process, rendered still simpler, has had complete success at Tours. The following is the description:

"For 1 cwt. (50 kilogrammes) silk, 22 lbs. (11 kilogrammes) of Aleppo galls, in powder, are boiled for an hour in a sufficient quantity of water. The bath is allowed to settle till the galls have fallen to the bottom of the boiler, from which they are withdrawn; after which 22 lbs. of English vitriol (or coppers) are introduced, with 13 lbs. of iron filings and 22 lbs. of country gum, put into a kind of two-handled cullender, pierced everywhere with holes. This kettle is suspended by two rods in the boiler, so as not to reach the
132 bottom. The gum is left to dissolve for about an hour, stirring it from time to time. If after this time some gum remains in the kettle it is a proof that the bath, which contains two hogsheads, has taken as much of it as is necessary. If, on the contrary, the whole gum is dissolved, from 1 to 4 lbs. more may be added. This cullender is left constantly suspended in the boiler, from which it is removed only when the dyeing is going on, and afterwards it is replaced. During all these operations the boiler must be kept hot, but without boiling. The galling of the silk is performed with one-third of Aleppo galls. The silk is left in it for six hours the first time, then for twelve hours; the rest, *secundum artem.*

"Lewis states that he has repeated this process in the small way, and that by adding sulphate of iron progressively and repeating the immersions of the silk a great number of times he eventually obtained a fine black.

"Astringents differ from one another as to the quantity of the principle which enters into combination with the oxyde of iron. Hence the proportion of the sulphate or of any other salt of iron and that of the astringents should vary according to the astringents made use of and according to their respective qualities. Gall-nut is the substance which contains most astringent; sumach, which seems second to it in this respect, throws down (decomposes), however, only half as much sulphate of iron.

"The most suitable proportion of sulphate of iron appears to be that which corresponds to the quantity of the astringent matter, so that the whole iron precipitable by the astringent may be thrown down and the whole astringent may be taken up in combination with the iron. As it is not possible, however, to arrive at such precision, it is better that the sulphate of iron should predominate, because the astringent when in excess counteracts the precipitation of the black coloring particles and has the property of even dissolving them.

"This action of the astringent is such that if a pattern of
133 black cloth be boiled with gall-nuts it is reducible to grey.

An observation of Lewis may thence be explained. If cloth be turned several times through the coloring bath after it has taken a good black color, instead of acquiring more body it is weakened and becomes brownish. Too considerable a quantity of the ingredients produces the same effect; to which the sulphuric acid, set at liberty by the precipitation of the oxyde of iron, contributes.

"It is merely the highly oxydized sulphate which is decomposed by the astringent, whence it appears that the sulphate will produce a different effect according to its state of oxydizement and call for other proportions. Some advise, therefore, to follow the method of Proust, employing it in the oxydized state, but in this case it is only partially decomposed and another part is brought by the action of the astringent into the lower degree of oxydizement.

"The particles precipitated by the mixture of an astringent and sulphate of iron have not at first a deep color, but they pass to a black by contact of air while they are moist.

"Under dyeing I shall show that the black dye is only a very condensed color, and that it assumes more intensity from the mixture of different colors likewise deep. It is for this reason advantageous to unite several astringents, each combination of which produces a different shade, but blue appears the color most conducive to this effect and it corrects the tendency to dun, which is remarked in the black produced on stuffs by the other astringents.

"On this property is founded the practice of giving a blue ground to black cloths, which acquire more beauty and solidity the deeper the blue. Another advantage of this practice is to diminish the quantity of sulphuric acid which is necessarily disengaged by the precipitation of the black particles and which would not only counteract their fixation but would further weaken the stuff and give it harshness.

"For common stuffs a portion of the effect of the blue
134 ground is produced by the rooting.

"The mixture of logwood with astringents contributes to the beauty of the black in a twofold way. It produces molecules of a hue different from what the astringents do, and particularly blue molecules, with the oxyde of copper commonly employed in the black dyes, which appears to be more useful the more acetate the verdigris made use of contains.

"The boil of weld by which the dye of black cloth is frequently finished may also contribute to its beauty by the shade peculiar to its combination. It has, moreover, the advantage of giving softness to the stuffs.

"The processes that are employed for wool yield, according to the observation of Lewis, only a rusty black to silk, and cotton is hardly dyed by the process proper for wool and silk. Let us endeavor to ascertain the conditions which these three varieties of dyeing demand:

"Wool has a great tendency to combine with coloring substances, but its physical nature requires its combinations to be made in general at a high temperature. The combination of the black molecules may therefore be directly effected in a bath in proportion as

they form, and if the operation be prolonged by subdividing it it is only with the view of changing the necessary oxidiz-ment of the sulphate and augmenting that of the coloring particles themselves.

"Silk has little disposition to unite with the black particles. It seems to be merely by the agency of the tannin with which it is previously impregnated that these particles can fix themselves on it, especially after it has been scoured. For this reason silk baths should be old and have the coloring particles accumulated in them, but so feebly suspended as to yield a weak affinity. Their precipitation is counteracted by the addition of gum or other mucilagi-ous substances. The obstacles which might arise from the sulphuric acid set at liberty *is* destroyed by iron filings or other basis. Thus baths of a very different composition but with the essential condition of age may be proper for this dye for cotton-black dye.

135 "See calico printing.

" Blue-black dye.—The mordant much employed in some parts of Germany for this dye, with logwood, galls, sumach, &c., is iron alum, so called on account of its having the crystalline form of alum, though it contains no alumina. It is prepared by dissolving 78 pounds of red oxide of iron in 117 pounds of sulphuric acid, diluting this compound with water, adding to the mixture 87 pounds of sulphate of potash, evaporating the solution to the crystallizing point. This potash, sulphate of iron, has a fine amethyst color when recently prepared, and, though it gets coated in the air with a yellowish crust, it is none the worse on this account. As a mordant a solution of this salt in from 6 to 60 parts of water serves to communicate and fix a great variety of uniform ground colors, from light gray to brown, blue, or jet black, with quercitron, galls, logwood, sumach, &c., separate or combined. The above solution may be usefully modified by adding to every 10 pounds of the iron alum dissolved in 8 gallons (80 pounds) of warm water 10 pounds of acetate (sugar) of lead, and leaving the mixture after careful stirring to settle. Sulphate of lead falls and the oxide of iron remains combined with the acetic acid and the potash. After passing through the above mordant the cotton goods should be quickly dried."

Also for the like purpose the article in the same volume entitled " Brown dye," on pages 285 to 287, which is in terms as follows:

" Brown dye.—Upon this subject some general views are given in the article dyeing explanatory of the nature of this color, to which I may in the first place refer. This dye presents a vast variety of tints, from yellow and red to black brown, and is produced either by mixtures of red, yellow, and blue with each

136 other or of yellow or red with black, or by substantive colors, such as catechu or oxide of manganese alone. We shall here notice only the principal shades, leaving their modifications to the caprice or skill of the dyer.

" 1. Brown from mixture of other colors:

" Wool and woolen cloths must be boiled with one-eighth their weight of alum and sulpho-tartrate of iron (see this article), afterwards washed and winced through the madder bath, which dyes

the portion of the stuff imbued with the alum red and that with the salt of iron black, the tint depending upon the proportion of each and the duration of the madder bath.

"A similar brown is produced by boiling every pound of the stuff with two ounces of alum and one ounce of common salt and then dyeing it in a bath of logwood containing either sulpho-tartrate, acetate, or sulphate of iron; or the stuff may be boiled with alum and tartar, dyed up in a madder bath, and then run through a black bath of iron mordant and galls or sumach. Here the black tint is added to the red till the proper hue be hit. The brown may be produced also by adding some iron liquor to the madder bath after the stuff has been dyed up in it with alum and tartar. A better brown of this kind is obtained by boiling every pound of wool with 2 ounces of alum, dyeing it up in cochineal, then changing the crimson thus given into brown by turning the stuff through the bath after acetate of iron has been added to it. Instead of the cochineal, archil or cutbear, with a little galls or sumach, may be used.

"Wool or silk may also receive a light blue ground from the indigo vat, then be mordanted with alum, washed, and turned through a madder bath till the wished-for brown be brought out. For the deeper shades galls or sumach may be added to the paler Brazil wood, with more or less iron mordant. Instead of the indigo vat Saxton blue may be employed to ground the stuff before dyeing it with madder, or 5 pounds of madder with 1 pound of alum, a solution of one-tenth of a pound of indigo in sulphuric
137 acid, may be used with the proper quantity of water for 20 pounds of wool; for dark shades some iron mordant may be added, or we may combine a bath of cochineal or cutbear, fustic, and galls, and add to it sulphate of iron and sulphate of indigo, blunted with a little potash.

"If we boil woolen cloth with alum and tartar, then pass it through a madder bath, and afterward through one of weld or fustic, containing more or less iron mordant, we obtain shades variable, according to the proportion of the materials, from modore and cinnamon to chestnut brown.

"After the same manner bronze colors may be obtained from the union of olive dyes with red. For 25 pounds of cloth we take 4 pounds of fustic chips, boil them for 2 hours, turn the cloth in this bath for an hour and drain it; then add to the bath from 4 to 6 ounces of sulphate of iron and 1 pound of ordinary madder or 2 pounds of sandal wood; put the cloth again in this compound bath, and turn it through till the desired shade be obtained. By changing the proportions and adding an iron mordant other tints may be produced.

"This mode of dyeing is suitable for silk, but with three different baths, one of logwood, one of Brazil wood, and one of fustic. The silk, after being boiled with soap, is to be alumed and then dyed up in a bath compounded of these three decoctions mixed in the requisite proportions. By the addition of walnut peels, sulphate of

copper, and a little sulphate of iron, or by passing the silk through a bath of annotto a variety of brown shades may be had.

"Or the silk may receive an annotto ground and then be passed through a bath of logwood or Brazil wood. For 10 pounds of silk 6 ounces of annotto are to be taken and dissolved with 18 ounces of potashes in boiling water. The silk must be winced through this solution for 2 hours, then wrung out, dried, next alumed, passed through a bath of Brazil wood, and finally through a bath
138 of logwood containing some sulphate of iron. It is to be wrung out and dried.

"Brown of different shades is imparted to cotton and linen by impregnating them with a mixed mordant of acetates of alumina and iron, and then dyeing them up either with madder alone or with madder and fustic. When the aluminous mordant predominates the madder gives an amaranth tint. For horse-chestnut brown the cotton must be galled, plunged into a black bath, then into a bath of sulphate of copper, next dyed up in a decoction of fustic, wrung out, passed through a strong madder bath, then through the sulphate of copper solution, and finished with a soap boil. Different shades of cinnamon are obtained when cottons first dyed up with madder get an olive cast with iron liquor in a fustic bath.

"These cinnamon and modore shades are also produced by dyeing them first in a bath of weld and verdigris, passing them through a solution of sulphate of iron, wringing and drying them; next putting them through a bath containing 1 pound of gall for 10 pounds of stuff, again drying, next aluming, and maddering. They must be brightened by a boil in soap water.

"A superior brown is produced by like means upon cotton goods which have undergone the oiling process of the turkey-red dye. Such stuffs must be galled, mordanted with alum (see madder), sulphate of iron, and acetate of lead (equal to $\frac{3}{4}$ of the alum); after washing and drying, dyed in a madder bath and cleared with a soap boil. The tint of brown varies with the proportion of alum and sulphate of iron.

"We perceive from these examples in how many ways the browning of dyes may be modified, upon what principles they are founded, and how we have it in our power to turn the shade more or less toward red, black, yellow, blue, &c.

"Brown may be produced by direct dyes. The decoction of oak bark dyes wool a fast brown of different shades, according to the concentration of the bath. The color is more lively with the addition of alum.

139 "The decoction of bastard marjoram (Origanum vulgare) dyes cotton and linen a reddish brown with acetate of alumina. Wool takes from it a dark brown.

"The bark of the mangrove tree (Rizophora mangle) affords to wool boiled with alum and tartar a fine red-brown color, which, with the addition of sulphate of iron, passes into a fast chocolate.

"The Bablah, the pods of the East Indian Mimosa cineraria, and the African Mimosa nilotica gives cotton a brown with acetate or sulphate of copper.

"The root of the white sea rose (Nymphæa alba) gives to cotton and wool beautiful shades of brown. A mordant of sulphate of iron and zinc is first given, and then the wool is dyed through the decoction of the root till the wished-for shade is obtained. The cotton must be mordanted with a mixture of the acetate of iron and zinc.

"Walnut trees (Juglans regia), when one contains a dark brown dyestuff which communicates a permanent color to wood. The older the infusion or decoction of the trees the better it does it make. The stuff is dyed in the lukewarm bath and needs no mordant, though it becomes brighter with alum; or this dye may be combined with a madder or lastic bath to give varieties of shade. For dyeing silk this bath should be partly lukewarm, for fear of causing irregularity of color.

"The prunings of horse-chestnuts may be used for the same purpose. With alumine or tin they give a bronze color, and with acetate of lead a reddish brown.

"Catechu gives color a permanent brown dye, as also a bronze and modore. When its solution in hot water is combined with acetate of sesquioxide of copper or when the stuff is previously mordanted with the acetates of copper and alumina mixed, sometimes with a little iron liquor mixed, dried, and dyed in, the bath being at a boiling heat.

"Peroxyacetate of copper gives a yellow brown or a bronze color and silk.

"The brown color called turquoise by the French is produced by 1 pound of catechu in 4 ounces of perfect vitriol 3 ounces of muriate of ammonia. The bronze solution is given by passing the stuff through a solution of acetate of sesquioxide of manganese, with a little acetic acid, drying, passing through a potash ley at 4° Baume, brightening and fixing with solution of chloride of lime."

Also from the Supplement to Ure's Dictionary, published by Appleton & Company in 1868, and for the like purpose the article entitled "Dyeing," contained on pages 471 to 472, which article in terms as follows:

"The relations of dyeing, with the principles of chemistry, constitute the theory of the art, properly speaking. This theory has for its basis the knowledge—

"1st. Of the nature and properties of the bodies which dyeing processes bring into contact.

"2nd. Of the circumstances in which these bodies are brought together, facilitating or retarding their action.

"3d. The phenomena which appear during their action; and

"4th. Properties of the colored combinations which are produced.

"The first of these generalities embraces a knowledge of the preparations which stuff necessarily undergoes previous to dyeing, and also the preparations of the dye-bath before bringing it into contact with the stuff.

"The operations to which stuffs are subjected before dyeing are intended to separate from them any foreign matters which may have become attached or are naturally inherent to the stuff. The

former are such as have been added in the spinning, weaving, or other manipulations of the manufacture and are all removed by steeping in an alkaline lye and washing. The second are the natural yellow coloring substances which coat some of the various fibres, both vegetable and animal, and the chorophylle or leaf-green of vegetables. The removal of these is generally effected by boiling in soap and alkaline lyes. A weak bath of soda, in which the stuff is allowed to steep for some time and then washed in water, is generally the only preparation required for wool in order that it may take on a uniform dye.

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"To remove the gummy or resinous matter from silk it requires boiling in soap lye. However, its removal is not essential to the stuff combining with the dye, as silk is often dyed while the gum remains in it, in which case it is only rinsed in soap lye at a very moderate heat, to remove any foreign matters imbibed in the process of manufacture.

"Vegetable fibre, as cotton, has such natural resinous matters that retard the reception of the dye removed by boiling, either with or without alkaline lyes, but the natural dun color of the fibre is not removed, which, from the laws of light and color already referred to, would interfere with the production of bright light tints. Under these circumstances, the natural color of the fibre has to be previously removed by bleaching, for which see the article, bleaching.

"The necessary preparation of the dye-drugs within the province of the dyer is to obtain the color in a state of solution, so as to allow the fibre to absorb it, and to produce chemical combination or to get the dye or color in such a minute state of division as it will penetrate or enter into the fibre of the stuff. These preparations embrace the formation of decoctions, extracts, and solutions, and also in some cases of precipitation, previous to immersing the stuff into the bath. Stuffs, chemically considered, have but a feeble attraction for other matters so as to combine with them chemically. Still, that they do possess certain attractions is evident from the various phenomena observed in the dyeing processes, and that this attraction is possessed with different degrees of intensity by the different fibres is also evident from the ease and permanence that woolen stuff will take up and retain dyes compared with cotton; and also certain dyes are retained and fixed within or upon one kind of fibre and not at all in another. This may be determined by plunging the dry stuff into solutions of the salts and determining the density of the solution before the immersion and after withdrawing the stuff. Wool abstracts alum from its solution, but it gives it all out again to boiling water. The sulphates of iron, copper, and zinc resemble alum in this respect. Silk steeped for some time in a solution of protosulphate of iron abstracts the oxide and gets thereby dyed and leaves the solution acidulous. Cotton in nitrate of iron produces the same effect. Wool put in contact with cream of tartar decomposes a portion of it; it absorbs the acid within its pores and leaves a neutral salt in solution in the liquor. Cotton produces no such effect with tartar, showing by these different effects that there are certain attractions between the stuff and

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dyes. This attraction, however, may be more what is termed a catalytic influence, the fibres of the stuff producing a chemical action with the salt or dye with which it is in contact. This attraction or affinity of the fibre for the dye-drug does not produce a very extensive effect in the processes of dyeing. More probably the power of imbibing and retaining colors possessed by the fibre is more dependent upon a mechanical than a chemical influence.

"All dye-drugs must in the first instance be brought into a state of solution in order that the dye may be imbibed by the fibre; but if the fibre exerts no attraction for the color so as to retain it, it is evident that so long as it remains capable of dissolving in water the stuffs, being brought into contact with water, will soon lose their color. A color thus formed does not constitute a dye, however strongly stained the stuffs may appear to be, in or out the dyeing solution. In order to form a dye the color must be fixed upon or within the stuff in a condition insoluble in water. Hence the mere immersion of stuff into a solution of color will not constitute a dye, except where the stuff really has an attraction for the color and retains it or causes a decomposition by which
143 an insoluble compound is fixed upon it, such as referred to by putting stuffs into a solution of iron. The abstraction of the color from a solution by the immersion of the stuff is often the result of a mechanical attraction possessed by porous substances, enabling them to absorb or imbibe certain coloring matters from solutions that are held by a weak attraction by their solvents. On this principle a decoction of cochineal, logwood, Brazil wood, or a solution of sulphate of indigo, by digestion with powdered bone-black, lose their color in consequence of the coloring particles combining by a kind of capillary attraction with the porous carbon without undergoing any change. The same thing happens when well-scoured wool is steeped in such colored liquids, and the color which the wool assumes by its attraction for the dye is, with regard to most of the above colored solutions, but feeble and fugitive, since the dye may be again abstracted by copious washing with simple water, whose attractive force, therefore, overcomes that of the wool. The aid of a high temperature, indeed, is requisite for the abstraction of the color from the wool and the bone-black, probably by enlarging the size of the pores and increasing the solvent power of the water.

"Those dyes whose coloring matter is of the nature of extractive forms a faster combination with stuffs. Thus the yellow, fawn, and brown dyes, which contain tannin and extractive, become oxygenated by contact of air and insoluble in water, by which means they can impart a durable dye. When wool is impregnated with decoctions of that kind its pores get charged by capillarity, and when the liquid becomes oxygenated they remain filled with a color now become insoluble in water. The fixation of iron oxide and several other bases also depends on the same change within the pores or fibre; hence all salts that have a tendency to pass readily into the basic state are peculiarly adapted to act as a medium for fixing dyes; however, this property is not essential.

"In order to impart to the stuffs the power of fixing the
144 color in an insoluble form upon it recourse is had to other substances, which will combine with the soluble and form with it an insoluble color; and it is not necessary that this new substance should have an attraction for the stuff or be capable of passing into a basic form any more than the original color, but it is necessary that it be rendered insoluble while in contact with the stuff.

"Such substances used to unite the color with the stuff have been termed mordants, which meant that they had a mutual attraction for the stuff and color, and, combining with the stuff first, they afterwards took up the color; but this is only so in some instances. A few examples will illustrate the bearing of these mordants. If a piece of cotton stuff is put into a decoction of logwood it will get stained of a depth according to the color of the solution, but this stain or color may be washed from the cotton by putting it into pure water, the color being soluble. If another piece of cotton stuff be put into a solution of protosulphate of iron and then washed from this, a portion of the iron will have undergone oxidation and left the acid and become fixed upon the fibre and insoluble in water. Whether this oxidation is the result of an influence of the stuff or the effect of the oxygen of the air and water in which the goods are exposed it does not matter meantime, only this fixed oxide constitutes an example of a mordant by its combining with the stuff. If this stuff is now put into a decoction of logwood the coloring matter of the logwood will combine with the oxide of iron fixed upon the fibre and form an insoluble color, which after washing will not remove from the stuff. If, instead of washing the stuff from the sulphate of iron solution in water, it be passed through an alkaline lye of soda or potash, the acid holding the iron in solution is taken hold of by the alkali and removed. The oxide of iron is thus left upon the stuff in a much larger quantity than in the former case and as firmly fixed, although not by any attraction between it and the fibre, but simply being left within it; and this stuff being
145 now put into the logwood liquor will form a dye of a depth according to the quantity of iron thus fixed upon the stuff and equally permanent with that which had been fixed on the stuff by the oxidation in working.

"Such, then, are the methods of fixing within the stuff insoluble colors from soluble compounds, and from these remarks the necessity of having the dye in solution will also be evident.

"Suppose, again, that the sulphate of iron be mixed with the logwood decoction, there will be produced the same color or dye as an insoluble precipitate. If the cotton stuff is put into this no color worthy of the name of a dye will be obtained, as the cotton will not imbibe within its fibre this precipitate. Place woolen stuff in the same liquid, there is formed a very good dye, the woolen fibre having imbibed a great portion of the solid precipitate, probably owing to woolen fibres being much larger than those of cotton. Thus with cotton and other stuff that will not imbibe freely solid precipitates, the mordant must be fixed within the fibre previous to applying the

coloring substances, such as the vegetable decoctions. It will also be seen that the dye which is the product of combination between the mordant and color is not that of the natural color of the drug, but the color of the compound. Hence the great variety of tints capable of being produced from one dye-drug by varying either the kind or intensity of the mordant; so that in the above instance it is not the color of the hematoxylin fixed on the stuff, but its compound with iron or tin or alumina, as the case may be, all of which give different tints.

"It is upon this principle of rendering bases insoluble while within the fibre by chemical means that has brought to the use of the dyer a great number of mineral dyes which in themselves, whether separate or combined, have no attraction whatever for the fibre—such as solutions of sulphate of copper and yellow prussiate of potash, nitrate of lead, and bic-romate of potash, &c. Suppose the stuff to be dyed a yellow by the two last-named salts was first put—

146 the solution of lead and then washed previous to being put into the bichromate solution, the greater portion of the lead would be dissolved from the stuff and a very weak color would be obtained. If the stuff from the lead solution was put directly into the bichromate solution a very good dye would be the result; but the portion of the solution remaining upon the surface of the stuff will combine with the chrome and form a precipitate which the fibre cannot imbibe, but will form an external crust or pigment upon the surface, which blocks up the pores and exhausts to no purpose the dye, causing great waste; hence the stuff from the solution of lead is put into water containing a little soda or lime, and the lead is thus reduced to an insoluble oxide within the fibre. The goods may now be washed from any loose oxide adhering and then passed through the bichromate solution, when the chromic acid combines with the oxide of lead, forming a permanent yellow dye. Thus it will be seen that whether the combination of the color with the stuff be chemical or mechanical the production of the dye which is fixed upon the fibre is certainly a chemical question, and the dyer should be familiar with the nature and principles of these reactions.

"There are a few instances where the dye produced does not come within the sphere of these principles, there being no mordants required nor any combination of the color formed within the stuff, but the dye-drug in its natural hue is fixed within the fibre. Such colors have been termed substantive, to distinguish them from those produced by means of mordants, which are termed adjective. Amongst this class of dyes and dye-drugs stands pre-eminent indigo blue. Indigo in its natural state is entirely insoluble in water and is of a deep blue color. The composition of this blue indigo is represented as—

Carbon, 16. Nitrogen, 1.
Hydrogen, 5. Oxygen, 2.

147 "But it is found capable of parting with a portion of the *the* oxygen, and by so doing losing entirely its blue color, and in

this deoxidized condition it is soluble in alkaline lyes and lime water. This colorless compound is termed indigogene. The opinion of Liebig upon the constitution of this substance is that indigo contains a salt radical, which he terms anyle, composed of C 16, H 5 N. He considers the indigogene or white indigo is the hydrated protoxide of this radical, and that blue indigo is the peroxide, represented thus:

	C	H	N	O	Water.
Salt radical, anyle	16	5	1	0	0
Indigogene	16	5	1	1	1
Blue indigo	16	5	1	2	0

"Advantage is taken of this property of indigo, of parting with its oxygen and becoming soluble, to apply it to dyeing, and it is effected by the following means when for the purpose of dyeing vegetable stuff such as cotton, and from the circumstances of these operations being done cold, the method is termed the cold vat, which is made up as follows: The indigo is reduced to an impalpable pulp by being ground in water to the consisteney of thick cream. This is put into a suitable vessel filled with water, along with a quantity of copperas and newly slacked lime, and the whole well mixed by stirring. After a short time the indigo is deoxidized and rendered soluble by a portion of the lime which is added in excess, and the reaction being represented thus:

1. Indigo, composed of	Indigogene. Oxygen.	Dyeing solution.
2. Copperas	Protoxide of iron. Protoxide of iron. Sulphuric acid. Sulphuric acid.	Peroxide of iron.
148 3. Lime	Lime. Lime. Lime.	Sulphate of lime. Sulphate of lime.

"The peroxide of iron and sulphate of lime are precipitated to the bottom, and the indigogene and lime form a solution of a straw color with dark veins through it.

"The operation of dyeing by this solution is simply immersion—technically, dipping. The stuff by immersion imbibes the solution, and when taken out and exposed to the air the indigogene upon and within the fibre rapidly takes oxygen from the atmosphere and becomes indigo blue, thus forming a permanent dye, without any necessary attraction between the indigo and the stuff.

"The indigo vat for wool and silk is made up with indigo pulp, potash, madder, and bran. In this vat the extracts of madder and bran perform the deoxidizing functions of the copperas in the cold vat by undergoing a species of fermentation.

"Pastel and wood, either alone or with the addition of a little indigo, are also used for the dyeing of wool and silk stuff, the deoxida-

tion being effected by the addition of bran, madder, and weld. In dyeing with these vats the liquor is made warm, and they require much skill and experience to manage, in consequence of their complexity, being always liable to go out of condition as the dyeing goes on by the extraction of the indigogene and the modification of the fermentable matter employed to deoxidize the indigo to supply that loss. The alkaline solvent also undergoes change, so that there must be successive additions of indigo and alkali. The principal attention of the dyer is the maintaining the proper relation of these matters, as too much or too little of either is injurious.

"Sulphate of indigo forms an intense blue solution, unaffected also by mordants. Vegetable stuffs dipped in this retain no dye, for the washing off the acid in order to preserve the fibre removes
149 the color, but animal fibre, such as woolen and silk, becomes dyed; a portion of the blue remains upon the stuff after washing off the acid, being retained by capillary attraction. This dye is termed Saxon blue, but it has very little of the permanence of indigo or vat blue, although it is also a substantive color.

"Another truly substantive color is that dyed by carth-mus or safflower, but the fixation of this dye upon the stuff differs from any of those referred to. Like indigo, it has no affinity for any base or substance capable of forming a mordant; its solvent is an alkali, but in this dissolved state it does not form a dye. The mode of proceeding in dyeing with carth-mus is first to extract the dye from the vegetable in which it is found by soda or potash, which is afterward neutralized by an acid previous to dyeing, which renders the color insoluble, but in so fine a state of division that no precipitation can be seen for some time, and the stuff immersed in this imbibes the color within its fibre, its lightness assisting this action, as the precipitate will remain suspended in water for days before it will subside. Vegetable fibre takes up this dye as easily as animal, but whether by an attraction for the stuff or by a mechanical capillary attration of the fibre, it is not so easily determined. A piece of stuff suspended in a vessel filled with water, having in it some insoluble carthamine, all the coloring particles will flow to and combine with the fibre from a considerable distance, giving a proof of existence of some force drawing them together.

"Such, then, are the various conditions and principles involved in the processes of fixing the dye within or upon the stuff.

"During the operation of dyeing there are certain circumstances which have to be attended to in order to facilitate and effect certain hues or tints of color. Thus, with many of the coloring substances, heat not only favors, but is necessary for the solution of the dye, and also its combination with the stuff or mordant. De-
150 coctions of woods are always made by hot water, and the dyeing processes with decoctions are in hot liquor. When the coloring matter of quercitron bark is extracted by boiling water the color produced upon the stuff will be a rich amber yellow, but if the extract be made by water at 180° Fahr. a beautiful lemon yellow will be the dye produced by it, using the same mordant in each case. Colors dyed by madder and barwood must be done at

boiling heat during the whole process or no dye is effected. Sumach, another astringent substance, is most advantageously applied at a boiling heat, and in order to have a large body of this dye fixed upon the stuff it should be immersed in the liquor while hot and allowed to cool together, during which the tannin of the dye undergoes some remarkable change in contact with the stuff. Safflower dyes are kept cold, so are tin bases, Prussian blues, and chrome yellows; by applying heat to the last a similar result is effected to that with bark; instead of a lemon yellow an amber yellow will be obtained. Almost all colors are affected less or more by the temperature at which they are produced. Some mordants are fixed upon the stuff by heat, such as acetate of alumina. The stuff being dried from a solution of this salt at a high temperature loses part of the acid by being volatilized, and there remains upon the fibre an insoluble suboxide, which fixes the dye. These remarks respecting the methods apply more particularly to vegetable stuffs, as cotton, and in many cases also to silk, but wool is always dyed at a high heat. Although wool seems to have a much greater absorbing power than cotton, the latter will absorb and become strongly dyed in a cold dye-bath in which wool would not be affected; but apply heat and the wool will be deeply dyed, and the dye much more permanent than the cotton.

"The permanence of colors is another property to be carefully studied by the practical dyer, as the color must not be brought under circumstances that will destroy its permanency during any of the operations of the dye-house. The word permanent, however, does not mean fast, which is a technical term applied to a
151 color that will resist all ordinary operations of destruction. As, for instance, a Prussian blue is a permanent color but not a fast color, as any alkaline matter will destroy it; or a common black is permanent, although any acid matters will destroy it, while Turkey red is a fast color and not affected by either acid or alkaline matters. A few of the circumstances affecting colors in the processes they are subjected to may be referred to in this place. If, for instance, the air in drying the dyed stuff in a hot chamber be moist there is a great tendency to the color being impaired in these circumstances. For example, a red color dyed with safflower will pass into brown, a Prussian blue will pass into a gray lavender, chrome yellows take an amber tint. Mostly all colors are affected less or more by being subjected to strong heat and moisture; even some of those colors termed fast are affected under such circumstances. A dry heat has little or no effect upon any color, and a few colors are made brighter in their tint by such a heat, as chrome orange, indigo blue, on cotton, &c.

"Some of these effects of heat and moisture differ with different stuff; thus indigo blue upon cotton is not so much affected as indigo blue upon silk, while safflower red upon cotton will be completely destroyed before the same color upon silk will be perceptibly affected. The same coloring matter fixed by different mordants upon the same stuff is also differently affected under these conditions.

"Light is another agent affecting a great influence upon the per-

manence of colors which should be also considered by the dyer. Reds dyed by a Brazil wood and a tin mordant, exposed to the light, become brown; Prussian blue takes a purple tint; yellow becomes brownish; safflower red, yellowish; and these changes are facilitated by the presence of moisture, such as exposing them to strong light while drying from the dye bath, either out or within doors. The direct rays of the sun destroy all dyed colors; even Turkey red yields before that agency.

152 "Boiling was formerly prescribed in France as a test of fast dyes. It consisted in putting a sample of the dyed goods in boiling water, holding in solution a determinate quantity of alum, tartar, soap, vinegar, &c. Dufay improved that barbarous test. He considered that fast-dyed cloth could be recognized by resisting an exposure of twelve hours to the sunshine of summer and to the midnight dews, or of sixteen days in winter.

"In trying the stability of dyes we may offer the following rules:

"That every stuff should be exposed to the light and air. If it be intended to be worn abroad it should be exposed also to wind and rain; that carpets, moreover, should be subjected to friction and pulling to prove their tenacity, and that cloths to be washed should be exposed to the action of hot water and soap. However, such tests are not at all applicable to most of the colors dyed upon cotton stuff. Not many of them can stand the action of hot water and soap, or even such acids as the juice of fruits. Indigo blue, one of the most permanent dyes on cotton, yields its intensity to every operation of washing, even in pure water.

"1. Red with blue produces purple, violet, lilac, pigeon's neck, mallow, peach blossom, *bleu de roi*, lint blossom, amaranth.

"Thus a Prussian blue dyed over a safflower red, or *vice versa*, will produce any of these tints by varying the depth of the red and blue according to the shade required; but the same shades can be produced direct by logwood and an aluminous or tin mordant. The stuff being steeped in sumach liquor previous to applying the tin mordant produces the reddish or purple tint when such is required.

"2. Red with black, brown, chocolate, maroon, &c. These tints are produced by various processes—to dye a deep orange by annotto liquor and then form over it a black by sumach and sulphate of iron gives a brown, or dye the stuff first a rich yellow by quercitron and a tin mordant and then over the yellow produce

153 a purple by passing it through logwood; chocolates are thus produced. A little Brazil wood with the logwood gives more of the red element. When maroon is required the red is made to prevail, and so by a judicious mixture these various tints are produced. Brown, especially upon cotton fibre, is more often produced direct by means of catechu. Steep the stuff in a hot solution of catechu, in which the gummy principle has been destroyed by the addition of a salt of copper, then pass through a solution of bichromate of potash at boiling heat, when a rich brown is obtained.

"3. Yellow with blue; green of a great variety of shades, such as nascent green, gay green, grass green, spring green, laurel green,

sea green, caladon green, parrot green, cabbage green, apple green, duck green.

"Green is essentially a mixed dye and produced by dyeing a blue over a yellow or a yellow over a blue. In almost all cases the blue is dyed first and then the yellow, and according to the depth of each or any of these are the various tints of green produced. With silk and wool, one kind of green dye may be produced simultaneously by putting sulphate of indigo into the yellow dye bath and than working the previously prepared or mordanted stuff in this. With cotton an arsenite of copper (Scheele's green) may be produced by working the stuff in a solution of arsenire of potash or soda and then in sulphate of copper, which produces a peculiar tint of green.

"4. Mixtures of colors, three and three, and four and four, produce an indefinite diversity of tints; thus red, yellow, and blue form brown olives and greenish grays, in which the blue dye ought always to be first given, lest the indigo vat should be soiled by other colors or the other colors spoiled by the alkaline action of the vat. Red, yellow, and gray (which is a gradation of black) give the dead-leaf tint, as well as dark orange, snuff color, &c. Red, blue, and gray give a vast variety of shades, as lead gray, slate gray, wood-pigeon gray, and other colors too numerous to specify. See Brown Dye.

"Care must be taken, however, in mixing these colors to study the depth of the tint required, as, for instance, were we wishing to dye a slate gray, and to proceed first by dyeing a blue, then a red, with a little of the gray, we would produce instead of a slate gray a purple or peach. The arrangement referred to applies only to the elements of the colors that enter into the composition of the various tints, so that a slate gray is a blue with a small portion of red and a still smaller portion of the black element that produces the gray tint. Thus dye the stuff first a deep sky blue by the vat; then by passing through a solution of sumach, with a small quantity of logwood, Brazil wood, copperas, and alum, gray will be produced. The Brazil wood gives the red tint, sumach, and copperas the black tint, the logwood assisting in this, and with the aid of the alum throwing in the puce or dove-neck hue, and thus by the variations of these hues by such arrangements any of the gray tints can be produced. See Calico Printing."

Also for the like purpose from Knight's American Mechanical Dictionary, published New York, J. B. Ford & Company, 1875, in the 2d vol. thereof, the article entitled "Ink," on pages 1186 and 1187, which article is in terms as follows:

"Ink.—1. A colored liquid or visc-us material used in writing or printing.

"The ancient ink was thick, and so is the modern Chinese. Demosthenes reproached Æschines with laboring in the grinding of ink as painters do in preparing colors. There is a difference between a paint and a dye, though the distinction is very imper-

fectly made out in customary language. A paint is smeared
155 over an object, a dye colors or stains it. Some inks are of one kind and some of the other. The essential characteristics of the best inks are limpidity, permanence, distinctness. The first enables it to flow easily and avoids clogging the pen. The second prevents its fading and becoming indistinct. The third makes it readily legible, both to the eye in following the motions of the pen and to the eyes of the readers subsequently.

"An ink was found in an inkstand at Heculaneum. Some ancient manuscripts show the ink in relief when held to the light and some have evidently been corroded by the ink.

"Black ink is a solution of tanno-gallate of iron suspended in gum-arabic water. Logwood adds to the color. Take bruised gall, 6 ounces; gum arabic, 4 ounces; green vitriol, 4 ounces; soft water, six pints; boil the galls in the water, add the other ingredients, keep in a bottle, shake occasionally, and in two months' time decant into bottles and cork.

"A drop or two of creosote or essential oil cloves will prevent molding, or, as Dr. Gale remarked to an astounded Indianian, 'will prevent the deposition of the ova of infusoria animalculæ.'

"He might have added, 'and the sporadic growth of thallogenic cryptogams.'

"Such would probably be fatal to the fungi. The mere definition settled our brother from Indiana.

"The addition of sugar to ink prevents sudden drying and makes copying ink.

"Japan ink. Ribaucourt's recipe.—Aleppo galls, 8 ounces; logwood, 4 ounces; sulphate of iron, 4 ounces; gum arabic, 3 ounces; sulphate of copper, 1 ounce; sug. candy, 1 ounce; the galls and logwood to be boiled in twelve pounds of soft water until reduced to six pounds; strain and add the other ingredients. The ink dries with a gloss; hence its name.

"Desormeaux recommends that the sulphate of iron be calcined to whiteness; coarse brown sugar instead of sugar candy; ¼ ounce of acetate of copper instead of 1 ounce of the sulphate, and agi-
156 tation twice a day for two weeks before decanting or bottling.

"Indelible ink.—The addition of lampblack to ink will fortify it against the discharge of its colors by hydrochloric acid.

"Close's receipe: Copal, 50 grains; oil of lavender, 400 grains; lampblack, 5 grains; indigo, 1 grain; dissolve the copal in the oil by heat and then add the coloring matter; thin with oil of turpentine.

"Sheldrake's receipe is a varnish, and is used for tombstones and marble asphaltum or pitch, oil of turpentine, amber varnish, lampblack.

"Red ink is a solution of alum col. with Brazil wood or an ammoniacal solution of cochineal.

"An indestructible red ink, or rather paint, consists of copal, 2 ounces; oil of lavender, 14 ounces; vermilion, 7 ounces.

"Blue ink.—Sulphate of indigo dissolved in water to the desired tint.

"Yellow ink.—French berries, 8 ounces; water, 1 quart; alum, a small quantity.

"Green ink.—A mixture of blue and yellow.

"Orange ink.—A mixture of red and yellow.

"Purple ink.—A mixture of red and blue.

"Brown ink.—A mixture of black and yellow.

"Sympathetic ink is an ink which is invisible till the writing is subjected to a subsequent operation, such as warming, exposing to sunlight, or to chemical reaction.

"The ancients were acquainted with several modes. Ovid indiscretely advises maidens to write with new milk. This, when dried, may be rendered visible by rubbing ashes upon it. Pliny suggests the milky juice of certain plants.

"Modern chemistry has given us a number of receipes. Writing in the following solution, subsequently dried, will be rendered visible by the means cited developing certain colors.

157 Ink.	Treatment.	Color developed.
Acetate of lead	Liver of sulphur	Brown.
Gola in aqua regia	Tin in aqua regia	Purple.
Infusion of galls	Sulphate of iron	Black.
Dilute sulphuric acid	Heat	Black.
Cobalt in dilute aqua regia	Heat	Green.
Precipitated oxide of cobalt in acetic acid and salt	Heat	Blue.
Lemon juice	Heat	Brown.

"Marking ink is an aqueous solution of lunar caustic thickened with sap green and gum. It is written on a surface prepared by a weak solution of carbonate of soda and gum arabic.

"A marking ink requiring no preparation of the surface is made of nitrate of silver, 1 ounce; bitartrate of potash, 1 ounce; solution of ammonia, 4 ounces; archil, ½ ounce; honey, 3 drachms; tragacanth powder, 1½ drachms. When written pass a hot iron over it or hold to the fire.

"Marking inks formed of a silver compound may be discharged by a solution of cyanide of potassium or a solution of corrosive sublimate, 1; sal ammonia, 1; water, 100.

"Lithographic ink for writing on stones or for transferring autographically from paper.—Dry soap, 100; white wax, 100; mutton suet, 30; shellac, 50; mastic, 50; lampblack, 30. Incorporate with heat; pour on an oiled plate; cut into sticks, and use like India ink.

"Lithographic printing ink resembles that for letter press, but is ground up with burned linseed oil, known as lithographic varnish.

"Copper-plate printing ink is similar to that for letter press, but is made of ivory-black or other fine quality.

"Printing ink is a smooth, jet-black oil paint made of boiled linseed oil, rosin oil, or nut oil and lampblack. Soap and rosin are sometimes added.

158 "Red and other colored printing inks are made of linseed oil boiled into a varnish and with pigments of the required colors—vermilion, Prussian blue, indigo, orpiment, chrome,

red and orange lead, verdigris, etc. See Ringwalt's "Encyclopedia of Printing," page 226.

"India ink is a compound of lampblack and size, formerly prepared from the pigment of the cuttle fish.

"Ink for zinc-plant labels.—Chloride of platinum, 100 grains in a pint of water; add mucilage and lampblack.

"Or: Sal ammonia, 1 drachm; verdigris, 1 drachm; lampblack, ½ drachm; water, 10 drachms; mix.

"Fire-proof ink for use in writing or printing on incombustible paper consists of powdered graphite, 22 drachms; copal or other resinous gum, 12 grains; sulphate of iron, 2 drachms; tincture of nut-galls, 2 drachms, and sulphate of indigo, 8 drachms. These materials are mixed together and boiled in water. This ink, which, besides being fire-proof, is said to be insoluble in water, under ordinary circumstances is black, but when colored inks are desired the graphite is replaced by an earthy or mineral pigment of the desired color."

Also, for the like purpose, from Knight's New Mechanical Dictionary, published Boston, 1884, the article entitled "Ink," on page 499 thereof, which article is in terms as follows:

"Ink, yellow.—A little alum added to saffron in soft hot water.

"For tin or zinc-plant labels.—Copper, 1; nitric acid, 10; water, 10, subsequently added.

"Stencil ink.—Shellac, 2; borax, 1; soft water, 10; boil; add gum arabic, 1; remove from the fire and stir in lampblack; *ad suf.* indigo added to tinge.

"For tin or zinc.—Sulphate of copper, 1; sal ammonia, 0.5; acetic acid, 2; add lampblack or vermilion.

"Blue.—Sulphate of indigo diluted with water.

"To restore faded ink.—Brush over with a solution of sulphide of ammonium.

159 "Or: Brush with a solution of tannin, remove excess by current of water, and dry at 144° to 170° Fah.

"Or: Brush over with solution of sulphocyanide of potassium 1 in 20, and dry in fumes of hot hydrochloric acid. Ferrocyanide might answer.

"To remove ink marks.—Moisten with solution of cyanide of potassium, and then solution of oxalic acid. Apply with a camel's-hair brush alternately.

"Sympathetic:

Material.	Treat with.	Result.
Sol. bichr. potas.	Logwood extract	Black.
Yellow ferrocyan. pot.	Sulph. iron	Blue.
Yellow ferrocyan. pot.	Sulph. copper	Red-brown.
Salt of arsenic	Sulph. acid vapor	Yellow.
Salt of antimony	Sulph. acid vapor	Orange.
Nitr. or chl. nickel	Heat	Green.
Nitr. or chl. cobalt	Heat	Red.
Chl. copper	Heat	Blue.

"See list also on p. 1187, 'Mech. Dict.'

"Japanese writing inks are very much like Chinese, and manufactured in a similar, though perhaps not quite identical way. The body of the ink is soot, obtained from pine wood or rosin, and lampblack from sesamum oil for the finest sort. This is mixed with liquid glue made of oxskin. This operation is effected in a large round copper bowl, formed by two spherical calottes, placed 1" apart, so that the space between can be filled up with hot water to prevent the glue from hardening during the time it is mixed by hand with the lampblack. The cakes are formed in wooden molds, and dried between paper and ashes. Camphor, or a peculiar mixture of scents, which comes from China, and a small quantity of ca-thamine (the red coloring substance of safflower) are added to the best kinds for improving the color, as well as for scenting the ink. There is a great difference in price as well as in quality between the various
160 kinds of ink, the finest article being rather costly. The most renowned manufactory is in Nara, the old capital of Japan, in the province of Yamato.

Black, Austrian ---------- "Scientific Amer. Sup.," 708.
Chromic ---------- "Sc. American," XXXV, 298.
Copying ---------- "Sc. Amer. Sup.," 708, 1975.
Indelible ---------- "Sc. American," XXXIV, 361; XXXV, 52; XXXVIII, 96.
Invisible for postal cards -- "Sc. American," XXXVI, 20.
Logwood ---------- "Sc. American," XXXV, 101.
Pencil ---------- "Sc. American," XLI, 228.
Powder and tablet ---------- "Scientific Amer. Sup.," 708.
Inkstand, railway ---------- "RR. Gazette," XXIV, 706.
Sympathetic ---------- "Sc. American," XXXIX, 377.
Long list of inks ---------- "Sc. American Sup.," 2498.
Cartridges and solid ink -- "Sc. American," XXXVII, 112.

"A variety of receipes and colors are given in Laboulaye's 'Dict. des Arts et Manufactures,' vol. II, cap. 'Encre.'"

All these publications are offered simply to show the state of the art relating to the preparation of dye precipitates, and not as complete anticipations of the patent. Proof of publication is waived in each case.

161 Mr. Briesen reads testimony of WILLIAM T. ALLEN, a witness called for defendants:

Q. 1. What is your name, age, residence, and occupation?

A. William T. Allen; 81 Wilson street, Brooklyn; occupation, secretary of the New York Dyewood, Extract and Chemical Company.

Q. 2. Do you appear here in obedience to *subpœna duces tecum*, of which I hand you a duplicate?

A. Yes, sir.

(The subpœna is marked for identification "*subpœna duces tecum.*")

Q. 3. Did you bring with you the books called for in said subpœna?

A. I did not bring the books.

Q. 4. Have you since the subpœna was served upon you spoken to Mr. Underwood, one of the complainants in this case?

A. Only to greet him as he came in the office here.

(Answer objected to as not responsive.)

Q. 5 (repeated). Have you spoken to Mr. Underwood since this subpœna was served upon you?

A. I haven't seen him before. I haven't except when he came in this office.

Q. 6. Then you have spoken to him since the subpœna was served upon you?

A. I have—shook hands with him.

162 Q. 7. Is Mr. Underwood a customer of your company?

A. Yes, sir.

Q. 8. Why didn't you bring the books?

A. They are bulky; they can be brought, I suppose: there would be ten or twelve of them.

Q. 9. How long would it take you to get them here?

A. It depends upon what books you want; I can bring you the sales book with all the sales that are recorded there in them. Do you want the ledgers?

Q. 10. I want all books that show transactions of the complainants or either of them respecting the sales to them of extract of logwood from 1881 to 1885. How long would it take you to bring all those books here?

A. Well, I should have to hunt for some of them.

Q. 11. Can you get them here to-morrow?

A. Yes, sir.

Q. 12. Can you bring them this afternoon?

A. Not very well; I have got to hunt away back to find them. I don't know that all the books are in existence.

(Counsel for complainants suggest that the defendants' counsel has no right to su-pœna, generally, the production of books and papers upon a suggestion that they may contain accounts of sales, not having proved that any books of this New York Dyewood, Extract & Chemical Company contain any entries whatever pertaining to this case, and that such a general subpœna is not in accordance with the established practice of this court under such circumstances.)

Q. 13. Has the said company, of which you are secretary, any books which show sales of extracts of logwood to the complainants between the time specified in the subpœna?

A. We have from 1883.

163 (Answer objected to so far as the date is concerned.)

Q. 14. I don't ask you to state the time—between the times.

A. Between the times, yes.

Mr. V. BRIESEN: I am willing to adjourn this examination to enable the witness to bring the books.

By Mr. HUDSON:

X Q. 15. Do you know whether your company has any books showing any such sales?

Mr. V. BRIESEN: I object to counsel speaking to the witness; this is not on cross-examination.

The EXAMINER: I do not think you have a right to cross-examine him at present.

Further examination suspended.

164 Mr. Briesen reads testimony of JOHN T. UNDERWOOD, recalled for defendants:

Q. 56. Mr. Underwood, you have heretofore testified in this case?
A. Yes, sir.
Q. 57. Your testimony was not concluded?
A. No, sir.
Q. 58. Will you please tell me when you made the invention which is described in your patent No. 348,073?
A. The latter part of the year 1884.
Q. 59. What do you mean by the latter part?
A. We had been experimenting for a considerable period, trying in the experiments various articles as described in the patent, and during the experiments we found that certain changes were necessary in order to produce the article in a state of perfect——
Q. 60. (Interrupting:) You are only asked to state what time in the year 1884 you are talking about.
A. About, I should say, October or November.
Q. 61. In addition to the patent No. 348,073, upon which this suit is based, you and Mr. Frederick W. Underwood also obtained patent No. 348,072, of which I now hand you a copy?
A. Yes, sir.

(Counsel for defendants offers in evidence, under the stipulation heretofore entered, a Patent Office copy of such letters patent No. 348,072, which he understands is to have the same force and effect as though duly certified, and the same is marked "Defend-
165 ants' Exhibit Underwood's Prior Patent," and the initials of the examiner, "H. L. B.," May 9, 1888.

(Counsel for complainants objects to the same as immaterial and irrelevant.)

Q. 62. Before October, 1884, had you never used precipitates of dye matter in the making of your carbon paper?
A. Only experimentally.
Q. 63. You had bought considerable quantities of extracts of dye-wood as early as the spring of 1883, had you not?
A. For various purposes, we had.
Q. 64. Had you not used precipitates from these extracts in 1883?
A. For experiments only, we had done so.

(Defendants' counsel objects to the answer as not responsive.)

Q. 65. Had you mixed any of these precipitates in 1883 with wax and oil?

A. We had, experimentally.

(Defendants' counsel objects to the word "experimentally" as not responsive.)

Q. 66. Had you put these mixtures on paper in 1883?

A. We had.

Q. 67. If you had done all that in 1883, how is it you come to say that the invention was not made by you for the mixture of extracts of dye-wood, wax, and oil spread on paper until October or November, 1884? Please explain it.

A. Because none of those sheets which were produced in that way were suitable for the purpose required.

Q. 68. What ailed them?

A. Various things.

166 Q. 69. Well, specify them.

A. In the matter of making carbon papers or reproducing surfaces (as carbon papers refers only to those which have carbon in them or some carbonaceous matter) it is necessary to have an article which not only will wear in continual use on the typewriter or stylus, but also has a firm surface so that it will not smut. Our attention was, first of all, brought to the need of something of this sort from the sales which we were making of regular carbon and of which we sold large quantities prior to this date. They would smut, they would not last, and the general cry was for something that would be better. We went to work experimenting to see whether we could produce such an article and found various precipitates of different dye matters and some gave a better result than others. Some would answer better for the purpose, as far as adhering better to the paper, and the matter of the different substances, such as spermaceti or other oleaginous matters, were all of them tried from time to time in various proportions and with various results. We could not apply for a patent till we had an article which was entirely perfect, and from the sheets which were so put forth prior to this date none of them were so, and complaints were very numerous.

(Defendants' counsel objects to the answer as not responsive.)

(Counsel for complainants states that he will insist that an answer of this nature to such a question as defendants' counsel puts is not open to the objection of being non-responsive, defendants' counsel's remedy being to interrupt the witness as he proceeds.)

Q. 70. Then you had sold before November, 1884, sheets of paper carrying mixture of extract of dye-wood with oleaginous matter?

A. Not as counsel puts it.

167 (Defendants' counsel objects to the answer as not responsive.)

Q. 71. Do I understand you to swear that in 1883 you had not

sold any carbon paper or semi-carbon paper covered with a mixture of wax and oil and extract of dye-wood?

A. I swear that we had not.

Q. 72. When had you sold those papers that you state in your answer to question No. 69 came back and were complained about?

A. In 1883.

Q. 73. Did they contain extract of dye-wood?

A. They did not.

Q. 74. When did you first sell any paper containing extract of dye-wood?

A. We have never sold any.

Q. 75. I presume you criticise my question owing to my failing to use the word "precipitate," and I therefore ask you whether you did not in the year 1883 sell carbon paper or semi-carbon paper containing a precipitate of an extract of dye-wood mixed with oleaginous matter.

A. We sold a substitute for carbon paper from time to time to parties with a view of their testing the same, as in the matter of carbon papers there is no possible way of finding out whether a thing is satisfactory without getting a general *very* opinion; that contained precipitate of dye matter, and the difference between the precipitate of dye matter and the extract of dye matter is very considerable, as they are totally different in character.

Q. 76. I understand you to testify that in the year 1883 you did sell, for the purpose of having the goods tested, carbon papers or substitutes for carbon papers which contained the precipitate of extract of dye matter mixed with oleaginous matter. Am I right?

A. You are.

Q. 77. And that such carbon paper contained a mixture of wax and oil?

168 A. They did.

Q 78. Will you kindly point out, with your patent No. 348,073 before you, precisely how the papers sold in 1883 differed from that described in said patent, meaning by the "paper" the complete carbon paper?

A. The paper put upon the market in those times differed very materially in result. The different woods, dye-woods, which were used and dyestuffs that were used were mixed with different salts from time to time, and none of them in any way were the same as those applied for in the patent, except as far as experiments went from time to time. They had more or less similar appearances.

Q. 79. In preparing the paper in 1883 that you sold during that year did you take extract of dye-wood, dissolve it in water, and then form a precipitate by the addition of some mineral salt, of metal, or alkali or both?

A. I did.

Q. 80. In preparing your carbon paper under the patent and since the issue thereof did you add to the precipitate any substance not named in the patent?

A. Not necessarily, unless for specific purposes from time to time.

Q. 81. Do you produce a complete black carbon paper under your patent without adding ferrocyanide of iron to the precipitate?

A. We do.

Q. 82. (Handing witness a sheet of semi-carbon paper.) Do you recognize the paper now shown you as made by your firm?

A. I do.

Q. 83. Do you mean to say that does not contain ferrocyanide of iron?

A. I don't know what it contains.

Q. 84. Have you bought considerable quantities of ferrocyanide of iron within the last three years?

A. For various purposes we have.

Q. 85. Have you mixed the same with the precipitate of dye matter in making carbons?

169 A. Not that I know of; I haven't done so.

Q. 86. If it had been done in your establishment would you have known it?

A. I think I should.

Q. 87. Then your testimony is that you know it has not been done?

A. My testimony is just as I have stated it, sir.

Q. 88. You have now testified that in the year 1883 you dissolved an extract of dye-wood, produced a precipitate therefrom by the aid of mineral salts or alkalies, or both, and mixed said precipitate with wax and oil, spreading the same on paper. Will you kindly point out in what respect that paper and the treatment to which it was subjected differs from the description contained in your patent No. 348,073?

A. The precipitate which I refer to was made from Brazil wood and peach wood, in conjunction with various salts.

Q. 89. Is that all the answer you can give to my previous question?

A. That is all I have ever done in regard to the matter at that time.

Q. 90. Well, you took extract of Brazil wood and dissolved it in water?

A. Took extract of Brazil wood and dissolved it.

Q. 91. In water?

A. In water.

Q. 92. And then you added what to make a precipitate?

A. I added copper.

Q. 93. Do you mean copper or——

A. (interrupting). Sulphate of copper.

Q. 94. What did that produce?

A. Produced a precipitate.

Q. 95. What was the color of it?

A. Blackish.

Q. 96. What next did you do?

A. I would set it out to dry; had it ground up.

Q. 97. Ground up alone or mixed?

170 A. With some lampblack, and that is all that I ever done with regard to the matter.

Q. 98. Didn't you mix it with wax and oil and put on paper?

A. It was given out to be mixed.

Q. 99. And so far as you know it was mixed?

A. Yes, sir.

Q. 100. And sold, to be tried by the customers?

A. It was never sold, sir.

Q. 101. I was talking all along of paper that you have testified you sold in 1883 to customers, with the intention that they should experiment with it, and which I understood you to say was made by mixing the precipitate of dye-wood with wax and oil, the mixture being spread on paper.

A. I never made any of those myself; I merely give you what I made.

Q. 102. With your own hands?

A. Certainly.

Q. 103. In your factory?

A. I don't know what experiments other than I made myself were made.

Q. 104. Then you don't know that you sold for experimental purposes any paper such as you have already described in 1883?

A. I know from the experiments that certain sheets were prepared that way.

Q. 105. How do you know that?

A. I don't know except from hearsay; that is all.

Q. 106. Who gave you that information?

A. My brother.

Q. 107. Your brother, Frederick W. Underwood, the other complainant?

A. Yes, sir.

Q. 108. When did he give you that information?

A. From time to time.

Q. 109. In 1883?

A. In 1883.

Q. 110. Before that?

171 A. No.

Q. 111. You personally did produce a precipitate from extract of Brazil wood in 1883 by adding thereto sulphate of copper; am I right?

A. Yes, sir.

Q. 112. You personally did not mix such precipitate with wax and oil?

A. No, sir.

Q. 113. You gave it out to be mixed?

A. Yes, sir.

Q. 114. You have every reason to believe that it was mixed and that it was put on paper?

A. Well, I suppose it was; there were a good many things which

one would try from time to time. It might be that the same was not found satisfactory, except that in the matter of experiment, of which a good many were made, some were useful and others were of no use.

Q. 115. Will you tell us what part of the invention which is described in the patent No. 348,073 you made personally and what part your brother made?

A. The invention is a matter of talking over the one with the other and trying the one with the other in various ways, and also with suggestions when one thing was found not to be what was wanted—suggestions and consultations together as to how such could be obtained, and certain preparations would be made by one and more by the other—either by one or the other.

Q. 116. Well, you have not answered my question.

Mr. HUDSON: I submit it is fully answered.

By Mr. HUDSON:

Q. 117. Can you point out any specific part?

A. I cannot point out any specific part, because it is so cojoint from our continuous considerations and suggestions as to how the matter might be improved that it would be absolutely impossible to point out which part was actually the one or the other.

172 By Mr. v. BRIESEN:

Q. 118. In 1883 you yourself had already produced the precipitate of dye matter out of sulphate of copper and the dissolved extract of dye matter, had you not?

A. Yes.

Q. 119. That certainly was not part of your joint invention.

A. Yes, sir; it was; that would come about this way: One thing would be tried and one thing would suggest itself to one of us, and the same would be tried by us, either jointly or severally, and if that wasn't found to be just what was right we would talk the matter over, and, as an outcome of that conversation, would decide that it would be advisable to try something in addition, and that would be carried out specifically.

Q. 120. The extract of Brazil wood precipitate by sulphate of copper gave a satisfactory black precipitate, didn't it?

A. It did not give a satisfactory black by any means.

Q. 121. Then why did you put the Brazil wood in the patent?

A. Because we had included it in our experiments, and for some purposes, if we wanted different colors, we could obtain them better from some woods than others.

Q. 122. But for the purposes of the patent the extract of Brazil wood, having sulphate of copper added thereto, furnishes a satisfactory precipitate, does it not?

A. For certain purposes it might, but it was not satisfactory to our ideas. At the same time, further experiments might lead to some use by which it would prove of considerable use.

Q. 123. The extract of peach wood, if treated with sulphate of copper, furnishes a satisfactory precipitate, does it not?

A. The precipitates were not, in conjunction with the oil and wax, what we considered satisfactory.

Q. 124. Why not?

173 A. The stuff did not act as it should; it wouldn't act; wouldn't adhere.

Q. 125. Does the extract of Sepan wood, when mixed with sulphate of copper, yield a satisfactory precipitate?

A. I don't know personally. I haven't tried it.

Q. 126. How about treating madder with sulphate of copper?

A. I don't know about madder. I haven't tried it.

Q. 127. How about alizarine?

A. I have not tried alizarine personally.

Q. 128. Now, if you treat extract of logwood with sulphate of copper, does that yield a satisfactory black precipitate?

A. It does.

Q. 129. And if you add soda, does that improve it?

A. It does.

Q. 130. In what respect?

A. It improves it in various ways. It acts altogether different when it has that in. I cannot tell you exactly where the difference comes. If you try with and without you would find the difference.

Q. 131. You can't specify the exact difference?

A. No, sir.

Q. 132. If you try the extract of logwood with soda and without sulphate of copper or other mineral salts, will you get a satisfactory black precipitate?

A. I haven't tried it. I don't think so.

Q. 133. Do you believe that you can get a satisfactory precipitate by using the alkali alone in connection with the extract of dye matter?

A. I think not.

Q. 134. Then why did you say, in your patents here in suit, that you precipitate these dye matters with alkalies and mineral salts or with alkalies, acids, and mineral salts, or with alkalies or acids alone?

A. Because in our patent we did not limit ourselves to making a black carbon, and you asked whether alkalies give a suitable black color.

174 Q. 135. I did not ask you that.

A. Well, I understood you so. The different salts in connection with different alkalies or acids render different properties to the precipitates, varying according to the salts.

Q. 136. Then alkalies, mixed with extract of logwood alone, will produce, to you- personal knowledge, a precipitate satisfactory for use?

A. So far as my personal knowledge goes, I can state that I do not know that it will.

Q. 137. When you speak in your patent, and especially in the claim thereof, of oil, wax, or oleaginous matter, what other oleaginous matter other than oil and wax do you have reference to?

A. Spermaceti, glycerine, or any other kinds of oleaginous matter.

Q. 138. Linseed oil, for instance?

A. Linseed oil, if it was not boiled, might do and would do, probably.

Q. 139. What is there in the patent to tell us that linseed oil boiled would not do?

A. I don't know that there is anything in the patent to state that boiled linseed oil would not do, but the patent does not state that linseed oil boiled would do.

Q. 140. Your patent says that for one gallon of water and one pound of extract of logwood you can use one pound of mineral salt and one pound of soda. Supposing these proportions were varied from, were departed from, and a smaller quantity of soda and a larger quantity of mineral salt—or *vice versa*—used, would the result be substantially different from that described in your patent?

(Counsel for complainants objects to the question unless it is limited to knowledge obtained by actual experiments of the witness, as he has not been shown to be either a chemist or qualified as an expert in the construction of patents.)

175 A. In the patent the proportions are not reserved as those which cannot be varied from, and from a reading of the patent you will find that it says, "We find to answer well."

Q. 141. Then I understand you to say that the proportions given are not essential?

A. Are not limited.

Q. 142. How long has the mixture of wax and oil been used, to your knowledge, in the making of carbon paper?

A. I don't believe that before we commenced our experiments, nor since that I know of, except by ourselves, that any such has been attempted until within a year or two after the patent was issued.

Q. 143. Do you mean to say that wax and oil had not, prior to 1884, being mixed with lampblack for making carbon papers?

A. I did not understand your previous question to refer to lampblack.

Q. 144 (repeated). How long has the mixture of wax and oil been used, to your knowledge, in the making of carbon paper?

A. Wax and oil probably have been used in the neighborhood of thirty-odd years with lampblack or in conjunction with any of the dry colors sold upon the market.

Q. 145. You have testified that your father's name was John Underwood. Was he the John Underwood to whom letters patent 38086 of March 31, 1863, were issued in conjunction with W. Maynard and C. R. Thayer, assignees, of which patent I hand you a copy?

A. He was.

(A copy of said patent is offered in evidence by counsel for defendants and marked "Defendants' Exhibit John Underwood's Patent of 1863, H. L. B., special examiner, May 9, 1888.")

(Objected to as immaterial and irrelevant.)

176 Q. 146. Were you acquainted with the said letters patent before the year 1863?

A. I knew that the letters patent were in existence; yes, sir.

Q. 147. Your father came from England, did he not?

A. He did.

Q. 148. When?

A. I think in 1872. September, 1872, I think.

Q. 149. Do you know of his having an English patent granted him in about the year 1857, for the invention specified in the 1863 American patent?

A. Yes, sir.

Q. 150. You did know of it?

A. Yes, sir.

Q. 151. Did your father, to your knowledge, ever make precipitates from extract of dye-wood?

A. Not that I know of.

Q. 152. Was your father at any time engaged in the business of making carbon papers?

A. I think that perhaps during the last year of his life our firm made carbon papers.

Q. 153. He was a member of the firm at that time?

A. I have described in the previous testimony that there never were articles of partnership or anything of that sort, but that we were virtually partners. We all did just what we wanted, and this same arrangement exists at the present time and always has; that is all.

Q. 154. The name of the firm at that time was John Underwood & Co.?

A. Yes, sir.

Q. 155. It never was "John Underwood" while carbon papers were made?

A. No, sir.

Q. 156. And you swear here (referring to previous testimony) that your father, while he was making carbon papers, never made any precipitate from extract of dye-wood?

A. He never made any carbon papers.

177 Q. 157. Well, I mean the business of which your father was chief?

A. What is the question, please?

Q. 158. Do you swear that in that business extracts of dye-wood were not precipitated for the purpose of making a pigment?

A. So far as I know, there were not.

Q. 159. And you never learned from your father, did you, that extract of logwood could be precipitated with the aid of certain alkalies or their agents?

A. I do not know that he ever gave me any such information; but, chemically speaking, anything will precipitate any of these things, and from a general chemical knowledge I knew such things to be precipitated.

Q. 160. How long ago did you know that?

A. Oh, I don't know. I have known the fact, in the broad sense, that you can take anything and can precipitate anything, but for any such purpose I did not. You can take any dye-woods or various solutions and precipitate them by the addition of any salt.

Q. 161. Do you know whether neutral chromate of potash will produce a precipitate of dye-wood from an extract?

A. It can be produced.

Q. 162. What color will it give?

A. It will be blackish.

Q. 163. How long have you known that fact?

A. I don't know; I couldn't state how long I have known that fact. Neutral chromate of potash will either make a solution or a precipitate, according to the proportions used.

Q. 164. Would you term a neutral chromate of potash an alkali?

A. Yes, sir; it is an alkali, I should think. The idea of neutral is that it is neutral salt.

Q. 165. Then, if these defendants should produce a precipitate of dye matter with the aid of a neutral chromate of potash and mix the same with wax and oil and spread the mixture on paper,
178 would they, in your opinion, use your invention patented in the patent here in suit?

(Complainants' counsel objects to the question, as the opinion of the witness as to the scope of the patent is not evidence.)

A. I really don't know.

Q. 166. Well, I will put the question in a different form, Mr. Underwood. Would the production of a precipitate of dye matter from extract of logwood by the use of neutral chromate of potash and the mixture of such precipitate with wax and oil and the spreading of such mixture on paper be the invention specified and intended to be specified by you in your patent here in suit?

(Complainants' counsel objects to the question.)

A. It would not.

Q. 167. Why not?

A. It would be totally different in character as far as the precipitate obtained.

Q. 168. In what respect?

A. Whether it would infringe or not I could not state at this time. Well, in what respect? That I couldn't say, except that any chemist knows that different precipitates obtained from different things have different properties which it is almost impossible to describe; they act differently in different mixtures.

Q. 169. How do you know what chemists know?

A. From the knowledge that I have of chemistry.

Q. 170. Have you studied it?

A. Only slightly.

Q. 171. Have you passed any course in that direction?

A. I have not.

Q. 172. Why do you say "any chemist knows"?

179 A. Because anybody who has read any chemical books or had any instruction whatever in chemistry from any source cannot fail but to know.

Q. 173. You mean he couldn't fail to know that there was a very important difference between a precipitate produced with the aid of neutral chromate of potash and one produced with the aid of an alkali?

A. I mean to state that he couldn't fail to know that there would, in all probability, be a precipitate of entirely different characteristics from the precipitation of chromate of potash or of any other mineral salt.

Q. 174. I was not speaking about mineral salt in my last question; I was speaking about the comparison of the neutral chromate of potash and the alkali.

A. What alkali?

Q. 175. Any.

A. There would be a very marked difference between a precipitate made with neutral chromate of potash and any alkali.

Q. 176. Then, neutral chromate of potash is not an alkali?

A. Neutral chromate of potash is of an alkaline nature, but its name signifies that it is a neutral salt.

Q. 177. What do you understand in your patent to be embraced by the term "alkali"?

A. Soda is an alkali; any of the alkali-s; but neutral chromate of potash is not one of the alkalies.

Q. 178. What one of the alkalies have you reference to?

A. Any of the alkaline salts.

Q. 179. Name some besides soda.

A. Well, I don't know that I could name them over here, myself; I don't think I could; I don't recall them at the present moment.

Q. 180. Bichromate of potash; is that a salt?

A. That is an acid salt.

Q. 181. Is chromate of potash an acid?

A. Potash is an alkali; chromate of potash, I don't know
180 what it is, so far as that goes; it is made by chromic acid and potash.

Q. 182. Is neutral chromate of potash an acid?

A. I have stated before that neutral chromate of potash is, as its name signifies, a neutral salt, neither one nor the other, but whether it might turn litmus paper I am unable to state one way or the other; it should be neutral.

Q. 183. Will all acids make a satisfactory precipitate of logwood extract, for the purpose of your patent?

A. I believe so.

Q. 184. Do you know it?

A. The range of acids is very large, and to broadly state that I know that all acids will make a satisfactory thing without looking into and testing personally each individual acid, it would be impossible to state; I should think they would.

Q. 185. When did you first try acids for the purpose of producing such precipitates?

A. Oh, I couldn't state when I first tried them.

Q. 186. Would you class alum as an alkali?

A. That depends upon in what form.

Q. 187. How? I am talking about alum.

A. I know you are; you can have alum either acid or alkali.

Q. 188. Either one or the other?

A. You could have it either way.

Q. 189. The alum of commerce is what?

A. Is acid; I do not mean to say that the alum of commerce is an acid, but that it has acid characteristics.

Q. 190. In your first examination, Mr. Underwood, you stated on the 12th of April, 1888, that during your father's lifetime you mixed the ingredients necessary for the preparation of carbon paper; will you please state what you so mixed during that time?

A. During his lifetime I mixed lampblack with oil and had a matter ground and a portion of it I ground myself.

Q. 191. And that was a mixture proper for carbon paper?

181 A. Yes, sir; it was.

Q. 192. What kind of oil?

A. Lard oil.

Q. 193. Without any wax?

A. Without any wax; and that is the general way of making carbon paper.

Q. 194. You also testified that since your father's death you mixed the ingredients necessary for carbon paper?

A. I have.

Q. 195. What did you so mix?

A. I mixed lampblack with oil; had the same ground. I mixed precipitate, in accordance with our patent, with oil and wax at that time; several times have I done this. I have also mixed various colors inks for use on carbon paper.

Q. 196. You have heard Mr. Andreas testify in this case, have you?

A. I have heard that Mr. Andreas testified in this case.

Q. 197. Were you present?

A. I was not. I didn't know that he was going to testify.

Q. 198. When did you first know Mr. Andreas?

A. I really couldn't state. I know that he was employed by us, but as to the date of such employment I don't know, as that wasn't in my department. I have seen him there, but I couldn't recall when, except that I know he was with us until within a year or two ago. I don't know exactly how long ago it was. We didn't discharge him; he couldn't get along with the other men. They informed us that he had to leave or they would leave—some petifogging thing between themselves. I told him we did not wish to lose him, but would prefer to retain him. We gave him the option of taking the ink, putting it upon the paper, and returning them to us.

Q. 199. What do you mean by ink?

182 A. I mean such inks as we might give to him already ground for the purpose of having it spread on the carbon.

Q. 200. Do you call the mixture you put on paper ink?

A. Yes, sir.

Q. 201. Have you any idea how long previous to leaving you Mr. Andreas had been with you?

A. I really could not state.

Q. 202. More than three years?

A. I really could not state. I don't know — long it was. Let me see. I should say it was more than three years, but I could not state.

Q. 203. What was the nature of his employment with you?

A. That I really do not specifically know, as it didn't come within my range. All that I know of him doing was just spreading the ink onto the paper for making carbon paper.

Q. 204. Your brother has more complete information on that subject.

A. He has, sir; it comes within his department.

Q. 205. Do I understand you to testify that although you knew in 1883 that a precipitate of dye matter could be mixed with oleaginous matter and spread on paper, you did not at that time know the best or most satisfactory manner of producing such precipitate?

A. At that time we repeatedly talked over the matter and found that the precipitate would not warrant us applying for a patent, because when we had the patent we wanted it perfect in every respect. That was the only reason.

(Defendants' counsel objects to the answer as not responsive.)

(Complainants' counsel objects to the question as going into a question that has already been gone into.)

183 Q. 206. Did you apply for the patent here in suit before Andreas left you?

A. A long time before; some two years or more; three years, I guess.

Q. 207. (Referring to a paper.) This paper shows that you applied for it on the 22d day of March, 1886. If he left you three years afterwards, he would still be in your employ?

A. The patent had been in force some time before Andreas left us; that I know. I think Andreas left us in 1887.

Cross-examination reserved.

Mr. Briesen reads testimony of WILLIAM T. ALLEN.

Examination resumed:

Q. 15. Have you produced the books inquired about; and, if so, what sales of extract of logwood to the firm of John Underwood & Company do they show?

184 (Complainants' counsel objects to that part of the question that asks for the contents of the books as immaterial and irrelevant.)

A. They show four sales in 1881 and 1882, and the following twenty-nine sales in 1883, 1884, and 1885.

(Producing a list, which is as follows:)

"1883.

" Jan. 11, 4 bx., 60 ea.
" April 28, 5 boxes, 60 lbs. ea.
" May 9, 10 " " "
" July 24, 34 lbs. liquid.
" Aug. 11, 10 boxes, 60 lbs. ea.
" Oct. 31, 4 " " "
" Nov. 1, 16 " " "
" Nov. 3, 6 lbs liquid ext.

" 1884.

" Jan. 16, 54 lbs. liquid ext.
" Mar. 22, 48 lbs. " "
" Apr. 1, 110 lbs. " "
" Apr. 10, 1 bl. " "
" Apr. 17, 5 boxes, 60 lbs. ea.
" June 9, 1 bl. liquid ext.
" July 31, 1 " " "
" July 31, 5 boxes, 60 lbs. ea.
" Sept. 9, 1 bbl. liquid ext.
" Oct. 10, 1 " " "
" Dec. 6, 1 " " "
" Dec. 6, 5 boxes, 60 lbs. ea.

" 1885.

" Feb'y 16, 1 bbl. liquid ext.
" Feb'y 16, 5 boxes, 60 lbs. ea.
" May 12, 5 " " "
" July 2, 5 " " "
" Aug. 3, 5 " " "
" Sep. 4, 10 " 30 lbs. ea.
" Oct. 3, 2 " 120 lbs. ea.
" Oct. 3, 1 box, 60 lb. ea.
" Oct. 24, 1 barrel liquid ext.
185 " Nov. 7, 5 boxes, 60 lbs. ea.
" Dec. 4, 5 " " " "
" Dec. 16, 5 boxes, 60 lbs. ea.
" Dec. 19, 5 " " " "

Q. 16. You say there were four sales on record in 1881 and 1882. On what dates were they and what were the amounts?

A. That I will have to take from these books. (Witness refers to books and reads as follows:) 2 boxes of extract of logwood, 60 pounds each, October 5, 1881; the next is November 7, 1881, 2 boxes extract of logwood, 60 pounds each, paid $9.90; the third is July 11, 1882, 2 boxes extract of logwood, 60 pounds each, and the fourth is August 1, 1882, 6 boxes extract of logwood, 60 pounds each; that is all there is in those years; that is all we have got on record; if there is any more in the petty-cash books they have been destroyed.

Q. 17. From what books did you take these four entries last mentioned?

A. From our order book; that is the only book they are recorded in.

Q. 18. How do you identify the order books showing those four particular entries?

A. They were in use at that time; the first and second of the entries are in No. 12 and the third and fourth are in No. 14.

Q. 19. Are those books of original entry?

A. Yes; that is the only entry there is for those things; the rest are in our sales books on the date designated there (referring to list produced in answer to Q. 15).

Mr. Hudson reads cross-examination:

X Q. 20. Where are the sales books from which you have made the list that you produced to counsel for defendants this morning?

186 A. Right here.

X Q. 21. Have you exhibited to the examiner or the counsel the entries that this list purports to be made on?

A. Not yet.

X Q. 22. Simply submitted the list?

A. Here are the books.

X Q. 23. Was this list made up by you?

A. That is my writing.

X Q. 24. Did you hunt through all these books to make that list?

A. I took the dates from the ledger, which contains the complete account; the ledger account commenced on the first of January, 1883—that is, it was opened on the first of January, and first entry is January 11th.

X Q. 25. Are the entries in these books in your handwriting made by you?

A. No, sir; I am not a book-keeper.

(Counsel for complainants notes a motion to strike out all the testimony of the witness relative to the list here produced by him, as the method adopted is not a proper one to the matters sought to be established, which motion will be pressed at the hearing.)

X Q. 26. I now call your attention to the entry that you have pointed out in "Orders" Book No. 12. Will you please read the entire entry?

A. (Reading:) J. Underwood, New Durham, N. J. Express, W. C.—that means will call—two boxes extract of logwood, 60, 8¼ cents, and N. S. M.—as a fraction.

X Q. 27. Read it as it is.

A. I don't think you have anything to do with our private mark.

X Q. 28. Go on.

A. (Reading:) One carboy of acetic acid, 106, M. S. U.—as a fraction—one bag of nut-galls, 142, 2 off; 140, S. A.—now a fraction of S. U.; 50 pounds of alum ppr.—which means paper—

187 b. under that, net cash; paid $39.37.

X Q. 29. Does it bear any date?

A. That payment?

X Q. 30. Any part of the entry?

A. October 5, 1881.

X Q. 31. The entry itself bears no date, does it?

A. All these entries until you come to October 6th or 7th.

X Q. 32. You mean to say it is on the foot of the page, the head of which bears the date October 5, 1881?

A. I mean to say it is practically under the date of October 5, 1881.

X Q. 33. I asked you to read the entry.

A. I have read the entry.

X Q. 34. And you insert a date that is not there?

A. You will find none of the entries dated except at the top of the page.

X Q. 35. In whose handwriting is this entry you have just read?

A. I can't tell you; it isn't mine; I don't know.

X Q. 36. Now turn to the other entry that you have referred to in the same book.

A. November 7, 1881.

X Q. 37. Please read all there is of that entry?

A. (Reading:) J. Underwood & Co., New Durham, N. J.: Exp. W. C.; two boxes extract of logwood, 60, s. n.; then there is a fraction, s. m.; under that, net cash; paid $9.90.

X Q. 38. That entry is also without date, but near the middle of a page at the head of which appears the date November 7, 1881, was it not?

A. Yes.

X Q. 39. In whose handwriting is the entry that you have last read?

A. I don't know.

X Q. 40. I now call your attention to the book marked "Orders No. 14," from which you have testified in chief; the entry to which you referred appears at the foot of a page at the head of
188 which is written July 11, 1882; please read the entry.

A. (Reading:) J. Underwood & Co.; after that W. C., as before, two boxes extract of logwood, 60, s., and a. u. after that; 1 bag nut-galls, 232–3; 229 at the side of that, s. a. afterwards; that is marked paid, $43.95.

X Q. 41. In whose handwriting is that entry?

A. The same handwriting as before.

X Q. 42. The same handwriting as the other two?

A. Yes, sir; I can only judge it as you would; it is one of our clerks; that is all I can say.

(Complainants' counsel objects to the answer as irresponsive.)

X Q. 43. The fourth of the entries to which you have testified appears near the foot of a page in the same book, at the head of which is written August 1, 1882; is that in the same handwriting as the other three entries?

A. I believe so; yes, sir.

X Q. 44. Read the entry.

A. (Reading:) J. Underwood & Co.; 6 boxes extract of logwood, 60, s., i. b. m.; after that, Exp. W. C.; under it, net cash; marked, of course, paid, $27.90.

X Q. 45. I call your attention to the first item on this list that you have presented, which is January 11, 1883, 4 boxes, 60 pounds each; was the original entry of that made by you in that book?

A. I don't keep any books, and haven't since I was a boy, only those required by the laws of the State; but as for keeping any cash book or sales book or ledger, I don't do it.

X Q. 46. Are any of the entries of the items referred to on this list that you have presented in your handwriting in the books?

A. No.

X Q. 47. Please refer to the item to which I have called your attention; what book is it you refer to?

189 A. January 11, 1883; that entry is evidently a mistake; I can't find it on the 9th, 10th, or 11th.

X Q. 48. What books have you consulted?

A. For this one, 31 and 32 sales books, which have that date and neighboring dates.

X Q. 49. These two books that you have just been examining appear to me as though the entries had all been made regularly by the same hand.

A. These are the same handwriting.

X Q. 50. And not as if they were original entries at the time the sale was made. Are they not in fact copied from something else?

A. I don't understand what you mean. The original entries when they first come in, if they come in in the shape of a verbal order, are entered in our order book. Afterwards they are entered in a delivery book, then into the sales book, and then into the ledger. This is the first book of complete entry.

X Q. 51. It is the first book of complete entry only in so far as it has the prices, and the others preceding it do not have the prices marked?

A. The order book has the prices usually when the order gets there; if any one comes and gets the goods at once they are not entered there.

X Q. 52. In the regular course of business an order would first be put on the order book or the delivery book, or both, and from those books entered in the sales books. Is that what you mean?

A. I mean an order for goods that are called for by a simple order given for them are not entered in the order book. They are entered in the delivery book, from that to the sales book, and from that to the ledger. If any order comes by mail or verbally, or in any way requiring shipment, or to be called for afterwards, it goes in the order book, in the delivery book, in the sales book, and in the ledger.

(Counsel for complainants here notes a motion on this evi-
190 dence to strike out all of the testimony of the witness in chief concerning what the books show and his list furnished, on the ground that the books here produced as sales books are not

sales books of original entries; which motion will be argued at final hearing unless counsel for defendants desires sooner to call it up. Without waiving this motion and objection, complainants' counsel proceeds):

X Q. 53. Please find the entry that appears on your list under date April 28th.

A. (Referring to a book:) There is the entry, April 28th.

(It is in book marked "Sales No. 35," near the foot of the page at the top of which is the date April 28th, 1883.)

(The last preceding clause in parenthesis having been dictated to the stenographer by complainants' counsel, complainants' counsel proceeds):

X Q. 54. Is that so?

A. Yes.

X Q. 55. Please read the entry.

A. (Reading:) J. Underwood & Co. Under that 5 boxes extract logwood, 60 each, 300, 7¾, $23.25. By express is under that and cash is under express.

X Q. 56. Refer to the item marked May 9th, 1883, on your list, indicating in what book it is found, and read the entire entry.

A. Book "Sales No. 34," at the foot of the page dated May 9, 1883. (Reading:) J. Underwood & Co., 10 boxes extract logwood, 60 each, 7¾, $46.50 cash. I have found the January entry;
191 it is in book "Sales No. 32," page headed January 17, 1883. Do you want the entry in full?

X Q. 57. Yes.

A. (Reading:) J. Underwood & Co., one barrel sal soda, 336, 1⅜, $4.62; 4 boxes extract logwood, 60 each, 240, 7¾, $18.60; total, 23.22.

X Q. 58. Now refer to the item of your list marked July 24th, 1883. Indicate in what book you find it and read the entry. From this time on you may omit reading anything but the items unless I specially call your attention to prices and figures.

A. In book No. 35, "sales" headed July 24, 1883, in the centre of the page. (Reading:) J. Underwood & Co., one jug, 60, liquid extract logwoods, 34 pounds; 3-gallon jug, 34 pounds.

X Q. 59. Next refer to the item of your list marked August 11th of the same year.

A. It is in book "sales 35," page headed August 11, 1883. (Reading:) John Underwood & Co., 10 boxes extract logwood, 60 each, 600 pounds; bichromate, 10 pounds.

X Q. 60. The chromate you understand to mean bichromate of potash?

A. It is an abbreviation; that is all.

X Q. 61. The next item on your list is October 31st.

A. "Sales 36," page dated October 31, 1883, at the bottom of the page. (Reading:) J. Underwood & Co., 4 boxes extract logwood, 60 each, 240.

X Q. 62. The next item on your list is November 1st.

A. "Sales 37," page headed November 1, 1883, in the middle of the page. (Reading:) J. Underwood & Co., 16 boxes extract logwood, 60 each, 960; boat George E. Robinson, shipped to J. Ogilvy & Co., Montreal.

X Q. 63. The next is November 3rd.

A. The same sales book, page headed November 3rd, 1883. (Reading:) J. Underwood & Co., 6 lbs. liquid extract logwood, 56.

X Q. 64. 1884, January 16, is the next item.

192 A. Sales book No. 36, page dated January 16, 1884. This is charged to John Underwood, evidently a mistake for the firm. One carboy muriatic acid, 133 pounds; liquid extract logwood, 54 pounds.

X Q. 65. The next item of your list is dated March 22nd.

A. Sales book No. 37, page headed March 22nd, 1884. (Reading:) John Underwood & Co., liquid extract logwood, 48 pounds.

X Q. 66. Is that all?

A. That is all of that.

X Q. 67. Are there any other items on your list of earlier date than March 22, 1884, than those we have gone over?

A. No, sir; none on that list except the four items in 1881 and 1882, concerning which I have testified.

(Complainants' counsel makes further objection to all the items of the lists after date of March 22, 1884, as immaterial and irrelevant on the ground that the application for complainants' patent in suit was filed two years after that date, as appears by the Exhibits Complainants' Patent in evidence, and on the defense to which this evidence seems pointed all subsequent dates would appear to be immaterial.)

WILLIAM T. ALLEN.

Sworn to before me—

HENRY L. BRANT,
Special Examiner.

193 Mr. Briesen reads further direct examination of JOHN T. UNDERWOOD:

Q. 208. Have you consulted with your counsel about the testimony that you have given for the purpose of giving your testimony on cross-examination?

A. I have not, sir; I haven't spoken a word to him about it.

Q. 209. Have you requested your brother to be here to-day?

A. I requested him the other day to be here, and had the thing been possible he would have been here. His arrangements had been made, as both letters and telegrams would show, that he was to go to Canada, and if he didn't go considerable difficulty would arise to ourselves and to others.

Q. 210. Have you heard the testimony of Mr. Allen, the last witness?

A. I have.

Q. 211. Have you any reason to doubt the correctness of the dates

and amounts of extract of logwood bought by your firm during the years 1881, 1882, 1883, 1884, and 1885?

A. I haven't heard those of 1885. As far as I heard I have no reason to doubt them, those entries that he referred to the books to find.

Mr. Hudson reads cross-examination:

X. Q. 212. I understand from your direct examination that all of the papers by you or by your firm sold to your knowledge prior to the fall of 1884, wherein a precipitate of dye-wood extract was used contained more or less carbon. Do you desire to be so understood?

(Objected to by counsel for defendants in view of the hostile character of the witness.)

A. I believe such was the case.

194 Mr. Brieseu reads redirect examination:

R. D. Q. 213. Why do you say, "I believe." Don't you know?

A. Because you asked me on the examination whether such were used. I told you I believed they were. If it came to a matter of positive knowledge, I couldn't state that they were, because I really do not know. It was only from the fact that experiments were being made that led me to suppose that such was the case.

R. D. Q. 214. Who would know, if you don't?

A. I suppose my brother would know whether he made any inks containing precipitates of dye matter.

R. D. Q. 215. Who else would know?

A. I don't know that anybody else would know.

R. D. Q. 216. Wouldn't Mr. Andreas know?

A. I don't know.

R. D. Q. 217. Perhaps he might?

A. I don't know.

R. D. Q. 218. Have you any reason to suppose that he would not know?

A. I haven't any reason to suppose that he would know.

R. D. Q. 219. Or that he wouldn't know?

A. I should think that Mr. Andreas would not know, for the simple reason that in all of our experiments or in all of our manufactures we always did a good deal of our experiments and a good deal of the testing of our manufacturing after the men had all gone home; and, in fact, when we were living in New Jersey, such was the case to such an extent that the neighbors used to call us "the night-hawks."

R. D. Q. 220. What do you mean by "we"?

A. I refer to myself and brother.

R. D. Q. 221. Then, as a night-hawk, you did make mixtures and apply them to paper, but yet you don't know what you so did?

A. I said that we experimented with mixtures. I did not state that we made them into paper or put them upon paper. I said that in our experiments we used to continue them in the evenings and

talk over the various things which likely could be used, and in the matter of all compounds which we make additions were made to substances at that time by either my brother or myself.

195 R. D. Q. 222. Do you classify amongst experiments those papers containing the precipitate which you actually sold for the purpose of having the purchasers experiment with them?

A. In the matter of actually selling papers made of precipitates of dye matter I could not positively swear to the fact that they were sold. I merely drew the inference from the fact of our experiments being made and certain sheets being necessary for testing that such were sold; that is all, because during this time we were not only manufacturing these papers, but manufacturing in larger quantities the regular carbon papers.

R. D. Q. 223. "This time," in the last answer, means what time?

A. The last answer speaks of other "this times." If you will state which one you refer to I will give you the information.

R. D. Q. 224. You said in your answer that "during this time" you not only sold these papers but also carbon papers. What time do you mean?

A. The time you refer to I understood to mean the period you spoke about in your question on the direct examination as to whether precipitates of dye matter had been sold.

R. D. Q. 225. Now, you ought to answer my question fairly. I asked you to state which time you had in your mind, which year or years, when you said that "during this time" you sold not only paper having the logwood precipitate, but also the carbon paper?

A. During 1883 and 1884.

R. D. Q. 226. Do you not recollect, Mr. Underwood, that in 1883 you took some of this paper containing the precipitate of logwood to others and represented that it was something new and asked them to try it?

A. I recollect taking to others papers which purported to have precipitates of dye matters in their coating in connection with other substances, but I had no actual knowledge as to what they were; that is, I would get in from the factory a great many differ-

196 ent lots and they would be sent to parties for the purpose of testing by use, and they would go and I would get another. We would mark them differently—by cutting off the corners or making them some different shape—and have the reports upon and in regard to them by their different identifications; some of them would contain different compounds.

R. D. Q. 227. In your last answer you said you recollect taking to others such papers. Please name those parties.

A. I don't now recollect the names of the parties to whom they were taken. I merely recollect the fact that in order to have them tested they were taken out, but as to where they went I could not state.

R. D. Q. 228. Don't you remember any one party?

A. I couldn't state that I positively recollect any one party. When I said that they were sent out I did not mean to say that I would take them; it was merely in a general sense that I spoke.

R. D. Q. 229. You said that you sent them for the purpose of having them tested; did you express that desire in writing?

A. No, sir.

R. D. Q. 230. Did you express it orally?

A. Yes, sir.

R. D. Q. 231. Then you must have taken them yourself?

A. The method was this—that when a person would come in for carbon paper we usually gave them the regular carbon paper, and if we thought that the samples or specimens which we had would be any better, we would give them some of these sheets and ask them to report to us upon them; let us know whether they liked and preferred them or whether they did not. They would not necessarily be taken by myself, but would be turned over to my clerk and those instructions given, and I suppose those instructions were followed, because we received reports from time to time as to the different qualities of the different specimens.

197 R. D. Q. 232. Did you receive these reports in writing or any of them?

A. We received the reports orally usually.

R. D. Q. 233. Some in writing?

A. Sometimes we would get a specimen of the work which had been done, which would consist probably of a couple of lines of typewritten matter, all of which would be destroyed, probably because it would merely show us whether it was smutty or whether it didn't give the desired results.

R. D. Q. 234. You don't remember receiving any report in writing on that matter, do you?

A. No, sir.

R. D. Q. 235. You testified as a matter of fact that you did not receive such reports in writing?

A. I did not positively state that I did not, but I stated that, as far as I knew, we did not. I don't recollect stating that I did receive such reports.

R. D. Q. 236. You don't recollect from whom you received such reports, do you?

A. I do not.

R. D. Q. 237. You can't name any one party, can you?

A. We might name one party we often sent to.

R. D. Q. 238. Who is that?

A. Mrs. Rushton.

R. D. Q. 239. Is Mrs. Rushton's still in existence?

A. Yes, sir.

R. D. Q. 240. Where?

A. At the Equitable building, 120 Broadway.

R. D. Q. 241. Has she a typewriting establishment?

A. She has.

R. D. Q. 242. You stated also that you marked the different kinds of papers for identification, some, for instance, by cutting away corners and the like. Did you make any record of the different identification marks and the classes of papers to which they pertained at the time?

A. No, sir.

R. D. Q. 243. Then how could you tell to which particular experiment the response referred?

A. Because they would be cut into different shapes. They
198 would have the corner cut off or be cut square or be cut zigzag, and we would merely ask whether they were suitable or not and which they preferred, and they would say either the one or the other, describing them by that, as we had asked them to do so in that way.

R. D. Q. 244. Did Mrs. Rushton pay you for the papers you so sent her in 1883?

A. She did not.

R. D. Q. 245. Did you send any such papers to Wyckoff, Seamans & Benedict in 1883?

A. I believe not.

R. D. Q. 246. Are you sure?

A. I am not sure.

R. D. Q. 247. Did you send any to the Misses Büttner?

A. I believe not.

R. D. Q. 248. To Miss Hill?

A. I think not.

Mr. Hudson reads recross-examination:

R. D. Q. 249. At the dates you have mentioned and at the present time you had and have, I believe, a store in New York, and you had particular charge of that store, and your brother had particular charge of the manufacturing establishment. Is that so?

A. Yes, sir; it is not really a store, but an office for the purpose of selling goods.

Mr. v. Briesen reads redirect examination:

R. D. Q. 250. Where was that store in 1883?

A. 30 Vesey street.

R. D. Q. 251. Where in 1884?

A. 30 Vesey street.

R. D. Q. 252. Is it still there?

A. It is still there.

R. D. Q. 253. You usually came to that store when in the morning?

199 A. Whenever I could get there.

R. D. Q. 254. What was the usual time?

A. From half past eight to nine o'clock.

R. D. Q. 255. And you would leave when?

A. That is a matter altogether hinging upon circumstances, because if there is anything to keep me, as there was in 1883 and 1884, and at the present time on any subjects at all at the factory, I go around there on my way in and that makes it different; sometimes, in fact, I would not get in until 11 or 12 o'clock, but as a regular thing I would leave at half past five in the afternoon, and yet, at the same time, I very frequently used to leave at 3.30, whenever anything might demand my doing so.

R. D. Q. 256. And when you left at half past five you went to Jersey and became a night-hawk?

A. I didn't say that we became night-hawks, but I said that our neighbors used to call us that from the fact that we were up to all hours.

JOHN T. UNDERWOOD.

Sworn to before me—

HENRY L. BRANT,
Special Examiner.

Mr. Briesen reads testimony of FREDERICK W. UNDERWOOD, called as a witness for defendants:

Q. 1. What is your name, age, residence, and occupation?

200 A. My name is already stated; age, 30; residence, 99 St. James place, Brooklyn; occupation, manufacturing chemist.

Q. 2. You are one of the complainants in this suit?

A. Yes, sir.

Q. 3. And one of the parties named in letters patent No. 348,073?

A. Yes, sir.

Q. 4. You are also a patentee together with your brother of patent No. 348,072?

A. Yes, sir.

Q. 5. Why did you take two patents for that invention?

(Objected to as immaterial and irrelevant, also as assuming that both patents are for the same invention, which is contradictory of the terms of the written paper.)

A. Because the one patent is especially for reproducing paper and the other patent is for the material which could be used for other purposes than reproducing paper.

Q. 6. And you deem it, therefore, an act of invention, having first invented the material, to put that material on paper. Do I understand you correctly?

(Counsel for complainants objects to the question as immaterial, irrelevant, and as assuming facts not proven, and incompetent.)

A. We were advised by our solicitors to take out the two patents whether it was absolutely necessary or not. Not understanding the law, I do not know.

Q. 7. Who were those solicitors?

A. Colburne Brooks, I think; C. Brooks, at any rate.

Q. 8. W. Colburne Brooks?

A. Yes, sir.

201 Q. 9. Where does he carry on his business?

A. He has now been dead somewhere in the neighborhood of two years; it may be more or less, but I cannot say. He has been dead some little while.

Q. 10. Now tell me, Mr. Underwood, when did you first sell or cause to be sold any paper containing a coloring composition composed of the precipitate of dye matter mixed with oleaginous matter?

A. It would be impossible for me, sir, to tell you when we first sold paper of such a description.

Q. 11. Did you sell such paper in 1883?

A. In 1883 we sold paper not exactly described as your question asks for; we sold paper having dye-wood precipitates in, but in combination with certain deliquescent salts and chemical driers, as, theoretically speaking, it was possible to produce and reproduc*ing* paper with deliquescent salts to keep the paper damp and chemical driers to keep the same from smutting, and in 1883 all papers were made with these deliquescent salts, which salts, acting most materially on the precipitate, also on the oil and wax, did not produce a satisfactory marketable article.

Q. 12. Do you mean to swear here that you did not in 1883 sell paper containing a precipitate of dye matter mixed with oleaginous matter without deliquescent salts, but in the presence of carbon?

A. I am willing to swear. I would like to know what you mean by "in the presence of carbon."

Q. 13. I mean mixed with lampblack and the like.

A. What is the question, please? I am not accustomed to be on the stand and I want to know what you said.

Q. 14. (Q. 12 repeated.) Do you mean to swear here that you did not in 1883 sell paper containing a precipitate of dye matter mixed with oleaginous matter without deliquescent salts, but in the presence of carbon?

A. I am willing to swear that to my knowledge not a sheet of reproducing paper was ever sold with these dye matters with-
202 out the deliquescent salts, though in the thousands of experiments made it is possible, and only possible, that a few sheets may have been sent out without the deliquescent salts, but, theoretically speaking, we were working to produce the paper with these deliquescent salts and, knowing the action of precipitates of all sorts on oil, thought that without the aforesaid salts the paper would be apt to dry up, but later on we did find that the papers could be produced without the deliquescent salts, and that this precipitate would act upon the oil of itself.

Q. 15. What are the deliquescent salts that you are speaking about?

A. Our experiments covered thousands, you might say, and when we gave up using them, finding the same impracticable for carbon paper, we also discovered that they could be used for other purposes, and think with further experiments that they will produce a new article. The same when invented we intend to patent, and for this reason, and this reason only, I must decline to disclose the deliquescent salts.

Q. 16. Please state what deliquescent salts were used on the paper sold by you in the year 1883 in connection with precipitate of dye-wood and oleaginous matter.

A. For the same reason, as just stated, I must decline to answer what would be giving away a new copying process which, going by theory, we are pretty certain can be produced with this combination of dye matter and deliquescent salts.

Q. 17. Then your testimony, as far as I have it now, is this: that in the year 1883 you did sell paper which contained a precipitate of dye-wood mixed with oleaginous matter and with a substance additional thereto which you do not wish to name. Am I right?

A. In the first place I am not willing to swear that I ever sold such paper as in your question you assume, but I did manufacture paper, only in regard to the addition of deliquescent salts I do not think it can be put in that way, as sometimes the deliquescent salts were mixed with our precipitate, and, chemically speaking, would alter the precipitate so materially that I scarcely think it could be called an addition, though a chemist would be better able to describe it.

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Q. 18. When did you first prepare a precipitate of dye matter by taking extract of logwood, dissolving the same in water, then adding either soda or a mineral salt or both, then placing in a filter and removing the precipitate?

A. It is perfectly impossible for me to say when I first made such a precipitate.

Q. 19. Well, fix the time as near as you can, Mr. Underwood.

A. That is perfectly impossible. I have been experimenting since I was fourteen, I think. I have experimented with all sorts of mineral and other precipitates, and therefore it would be impossible for me to answer your question in that way. If you can put it in any other shape I will try to answer it.

Q. 20. You don't like the form of my question; is that it?

A. I beg your pardon, sir, I did not say that, but in my answer I say I have been experimenting since I was fourteen, making sixteen years of experimenting, and therefore you can see how perfectly impossible it is for me to answer the question in that——

Q. 21. In that form.

A. I mean to say to give you the exact date or anywhere near it when I first made a precipitate.

Mr. HUDSON: The question does not ask for a precipitate, Mr. Underwood. You will observe that it contains a good deal more than a question concerning a precipitate, and you may answer it more fully.

(Counsel for defendants objects to the inference by complainants' counsel with this examination of the complainant in person, the object of this examination being to show to the court the anxiety of the witness to evade the proper questions that are propounded to him, and that the court may measure the character of the complaint in this cause by the testimony of the complainants, and any interference of this kind during the direct examination of the witness is objected to as calculated to obstruct the proper proceedings of this examination.)

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(Counsel for complainants submits to the court that such interruption was not only justifiable, but eminently proper, and in no way warranted the remarks of the defendants' counsel upon it, and asks that the question, the scope of which does not seem to have been understood by the witness, be read again to him.)

(Counsel for defendants again protests against the above interference, and propounds now the following question:)

Q. 22. (Handing patent to witness:) Are any of the salts which are named in the patent No. 348,073 deliquescent salts?

A. Answering that question, I would say that I wish counsel for defendants to tell me if I am regular in so doing, but in common equity to myself I deny the charge that I am not willing to give all the information possible in my power; and now to answer the question: The salts, or some of them, mentioned in this patent are deliquescent salts before they are mixed with the precipitate; afterwards they are not; but none of these salts, even the most
205 deliquescent, would, as one skilled in the arts can easily tell, answer in any way to keep the paper moist by the effect of the atmosphere.

(Counsel for defendants objects to the last part of the answer as not responsive.)

Q. 23. Are those deliquescent salts?

A. I don't know anything about that.

Q. 24. Answer my questions just as they are propounded.

A. I am willing to, but I don't know anything about it.

Q. 25. Can you tell me when, or about when, you first produced a precipitate of dye matter in the following manner: Taking extract of logwood, dissolving the same in water, then adding to the mixture soda and a mineral salt or either, then filtering the mixture thus produced and removing the precipitate?

A. As near as my memory will carry me, I should say the same was made somewhere near 1880.

Q. 26. When did you first mix such a precipitate with oleaginous matter?

A. I mixed such a precipitate with oleaginous matter only, as near as my memory will carry me, about 1884 to 1885—the latter part of 1884—but I think most likely it was in the first part of 1885.

Q. 27. Now, Mr. Underwood, you have undertaken to avoid my question by putting into your answer the word "only," my question being broad enough to cover the exception which you made. I therefore again ask you when did you first mix such a precipitate with oleaginous matter.

(Counsel for complainants suggests that the witness's distinction was warranted by the question. If examining counsel desires to know when other materials, as well as oleaginous mate-
206 rials, have been used in such combination he certainly could have put the question in that form.)

(Counsel for defendants, in view of the testimony of this witness's brother, which this witness bluntly contradicts, claims a right to conduct this examination in a manner somewhat more severe and exacting than otherwise would be the case, and he deems himself the more justified in this course because it appears that this witness has consulted counsel in advance of going on the stand and has laid down a policy of testimony, which is quite perceptible, by which

the admissions made by his brother may be weakened in their effect upon this suit.)

(Counsel for complainants suggests that the remarks of defendants' counsel put upon the record are not in any way justified by the facts of the case. There is no such contradiction between the testimony of this witness and that of his brother as counsel for defendants suggests, nor is there the first particle of evidence of a consultation with counsel for any purpose such as he has seen fit to put upon the record, no such consultation having taken place.)

(Counsel for defendants withdraws question No. 27.)

Q. 28. I again ask you, when did you first mix such a precipitate with oleaginous matter, or about when?

207 A. In answering your question as somewhat of a chemist I would say that this precipitate was mixed with oleaginous matter in 1885 or quite the latter part of 1884; I do not wish to deceive defendants' attorneys, but, chemmically speaking, as I added other salts, I do not consider therefore that the precipitate was mixed alone with oleaginous matter.

Q. 29. I didn't ask you whether it was mixed alone; I ask you when it was first mixed with oleaginous matter with or without other additions.

A. With other additions it was first mixed, as near as my memory will carry me, somewhere near 1880.

Q. 30. And when with other additions was such mixture first put on paper?

A. I should say somewhere about the same time.

Q. 31. When was paper having such mixture first sold by you or your firm?

A. I am not certain, but I suppose somewhere about the same time.

Q. 32. At any rate, in the year 1883 it had already been sold, had it not?

A. With the other additions of the aforesaid salts that I have mentioned, it had been sold.

Q. 33. Now, concerning the deliquescent salts that you have mentioned, but the names of which you do not wish to disclose, do you know whether any of them are contained in defendants' paper?

A. I am pretty certain—I am almost willing to swear—that they are not.

Q. 34. Why not?

A. Because the defendants would see no reason for using them, and only some one with a chemical knowledge would think of using them as we did.

Q. 35. That is your reason for assuming that the defendants do not use it; but have you analyzed their paper to see?

A. I have not.

Q. 36. If you did analyze it, would you be able to find the deliquescent salts?

A. Very easily.

208 Q. 37. Ferrocyanide of iron is not one of the deliquescent salts you had in mind?

A. Ferrocyanide of iron is not in any manner, shape, or form a deliquescent salt.

Q. 38. A paper manufactured by you and stamped under the patent in suit has not had ferrocyanide of iron added to the precipitate before mixing with oleaginous matter, has it?

A. Sometimes it has and sometimes it has not.

Q. 39. Why didn't you mix ferrocyanide of iron as an addition to the precipitate?

A. Because it is not necessary to add it.

Q. 40. Why do you add it, if you do add it?

A. In making precipitates of all sorts they will vary, though you may use the same proportions every time. The oxygen in the air will act on them, and sometimes you can tell, or one skilled in the art can, that it is not quite as black a shade as he would like, and then such a person would immediately add ferrocyanide of iron or indigo, or some other blue, the same as is now added in all carbon paper to counteract the yellow color of the lampblack, but it is not necessary to use it with this precipitate.

Q. 41. But still you do use it with this precipitate, don't you?

A. Sometimes we use it and sometimes we do not.

Q. 42. When you do not use it what do you use instead?

A. We use nothing in place of ferrocyanide, because the oxygen will sometimes make the precipitate black enough without it.

Q. 43. What oxygen?

A. The oxygen in the air.

Q. 44. The oxygen in the air will make the precipitate black enough without it; is that your testimony?

A. The oxygen will quite often, if it has enough of it, make it black enough without it.

Q. 45. Can you tell by looking at a paper whether it has or has not ferrocyanide of iron in it?

209 A. No mortal can possibly tell whether a paper has ferrocyanide of iron in it by simply looking at it; it is easy enough to tell it by testing it.

Q. 46. When did you make your invention which is described here in suit?

A. Somewhere near 1885.

Q. 47. What do you mean by that—somewhere near 1885?

A. I think, but I am not positive, that the invention was made in 1885; it is possible that it may have been late in the fall of 1884.

Q. 48. Now, the invention, as I understand it from your previous testimony, consisted practically, as made in 1884, in your discovery that the deliquescent salts were not necessary in that mixture, is that it?

A. Prior to 1884 whatever experiments we had we used the deliquescent salts and chemical driers. We did not make a satisfactory article. In 1885, or the latter part of 1884, we discovered it was possible to make a marketable article with this precipitate of dye matter ground in oleaginous matters without the aforesaid salts, and

therefore the invention consisted in making a marketable article with this precipitate of dye matter and oleaginous substance.

Q. 49. And you swear that all the paper which you sold in the year 1883 that had a precipitate of dye matter had also the deliquescent salt, which you afterwards eliminated; do I understand you correctly?

A. Excuse me. What is the meaning of the last word?

Q. 50. Discarded.

A. As I before stated, to the best of my belief all paper had these deliquescents salts or chemical driers—I mean to say and chemical driers—and in fact I do not think I ought to have put it in this way, because while they all contain the deliquescent salts they do not all contain the chemical driers. I have before stated, as I shall here do again, that it is possible in the thousands of experiments made that a few sheets may have been put on the market without these salts.

210 Q. 51. Which of the salts named in the patent No. 348,073 are deliquescent and which are not?

A. Logwood is not a deliquescent salt; some alkalies are, some are not; some mineral salts are, some are not; hæmatoxylin is not a deliquescent salt; Brazil wood is not a deliquescent salt; sepan wood is not a deliquescent salt; peach wood, madder, or its active principle, alizarine, is not; soda is not considered a deliquescent salt; sulphate of iron or copper could scarcely be called a deliquescent salt.

Q. 52. When did you first try to make a precidítate from the active principle of sepan wood?

A. I have never tried to make a precipitate from the active principle of sepan wood; but, chemically speaking, using seapan wood we only use it for the active principle, not for the wood, gum, or other extraneous matters.

(Defendants' counsel objects to the last part of the answer as not responsive.)

Q. 53. When did you first make a precipitate from the active principle of peach wood?

A. I would answer the same.

Q. 54. When from madder?

A. Madder; I should say somewhere between 1880 and 1886.

Q. 55. That is rather a broad space; can't you define it a little more clearly?

A. I am sorry, but it is perfectly impossible for me to do it.

Q. 56. Well, it ought to have been before you prepared your specification, it seems to me.

A. I only made it in experiments, and that is the reason that I cannot be more definite.

Q. 57. You found it to be fully as satisfactory as logwood?

A. It is not as satisfactory as logwood.

Q. 58. Why not?

A. Because it has not the same depth of color.

211 Q. 59. How do you make a black precipitate from madder?

A. The best way to make a black precipitate from madder would be to make a decoction, mix the same with some alkali, and add to the same sulphate of iron.

Q. 60. That you have tried?

A. I have tried it; yes, sir.

Q. 61. What alkalies beside soda can be used in connection with the process described in your patent?

A. All and every of them.

Q. 62. Ammonia?

A. Ammonia.

Q. 63. What acids are used in that process?

A. The most satisfactory acid would be muriatic.

Q. 64. Now, supposing you have extract of logwood and you want to make a black precipitate with the aid of an acid without an alkali, how would you go to work?

A. Will you let me look at the patent? Have I a right to the patent?

Q. 65. No, sir; you can't have the patent just now; I want to see what your answer is without it.

A. I have asked for the patent and have been refused to have it. The only reason I asked for the patent was I did not think that in our patent we especially stated black. With acids alone I do not think it would be possible to produce a black without you took a strong or a fairly pure strong acid.

Q. 66. If you took extract of logwood and treated it with an acid for the purpose of your invention as specified in the patent, can you tell us how you would use that acid?

A. Yes.

Q. 67. Please do so.

A. I would take muriatic acid and treat extract of logwood in solution with the same. I would have the acid weak if I wished to produce a red carbon. If I wished to produce a blacker color, or almost black, I would take a strong solution of muriatic acid. I would treat my extract of logwood solution with the same.

212 I would expose the same to the sun's rays or get oxygen to it in large quantities, and in that way I should have my precipitate.

Q. 68. Now, supposing instead of muriatic acid you used hydrochloric acid——

A. Excuse me; it is precisely the same.

Q. 69. I know it; and supposing instead of hy-rochloric you used sulphuric acid, how would that act?

A. It would act precisely the same and perhaps with a better result; they produce the black perhaps better.

Q. 70. Your testimony is that all acids will produce the result in question?

A. Excuse me; my testimony is no such thing.

Q. 71. Which acids will not?

A. The very weak acids, as one skilled in the art would know, would not.

Q. 73. Such as what?

A. Acetic acid.

Q. 73. Why didn't you say so in your patent?

A. Because one skilled in the art would know it.

Q. 74. Why so?

A. It is a well-know- fact that the very weaker acids do not precipitate dye matter.

Q. 75. And it is a well-know- fact since what time?

A. Since—I do not know; but I suppose somewhere about the fifth century, I should think. Excuse me; I will alter that. I will say since the seventh century.

Q. 76. To your knowledge it was then in use?

A. Pardon me; it was not.

Q. 77. It was in the seventh century a common thing to make a precipitate from logwood with the aid of an acid?

A. No, sir; I did not mean to infer that at all, because logwood has only been discovered—I am not certain how long—but I think somewhere in the reign of Queen Elizabeth, in the sixteenth century, and I suppose since the seventeenth century the effects of acids upon it have been known.

Q. 78. And the effects of mineral salts upon it, how long have they been known?

213 A. I am not certain, but I think somewhere in the reign of Queen Elizabeth, when an act of Parliament was passed to prevent the use of logwood in dyeing, as they considered it too fugitive; and I should say that since that time it was known.

Counsel for defendants, in order to show the state of the art, offers in evidence the following English letters patent, to wit, No. 2237 of 1798, granted to Robert Frith for dyeing fabrics.

The same is marked Defendants' Exhibit Frith English Patent.

English patent No. 11544 of 1847, to C. A. Kurtz, for a new manufacture of coloring matter to be used for dyeing and printing fabrics.

The same is marked Defendants' Exhibit Kurtz English Patent.

English patent No. 342 of 1856, to Charles Swan and George F. Swan, for coloring matter for writing, staining, or dyeing; also suitable for the production of copying fluid.

The same is marked Defendants' Exhibit Swan English Patent.

English patent No. 1988 of 1857, to Thomas Roberts and
214 John Dale, for obtaining pigments from dyewoods and appl-ing the same to paper-hangings.

The same is marked Defendants' Exhibit Roberts and Dale English Patent.

English patent No. 2972 of 1806, to Ralph Wedgwood, for producing duplicates of writings.

The same is marked Defendants' Exhibit Wedgwood English Patent.

English patent No. 2206 of 1856, to John Underwood and Frederick Valentine Burt, for manufacturing of copying inks for printing.

The same is marked Defendants' Exhibit Underwood and Burt English Patent.

English patent No. 985 of 1860, to John Dale and Heinrich Caro, for dyeing yarns and fabrics.

The same is marked Defendants' Exhibit Dale and Caro English Patent.

English patent No. 1744 of 1860, to John Henry Johnson, coloring matter and means for obtaining the same.

The same is marked Defendants' Exhibit Johnson English Patent.

English Patent No. 3021 of 1861, to Alexander Schultz, for colors for printing and dyeing fabrics.

The same is marked Defendants' Exhibit Schultz English Patent.

215 English patent No. 1392 of 1862, to F. F. B. Mayall, for dyeing.

The same is marked Defendants' Exhibit Mayall English Patent.

English patent No. 1354 of 1863, to William Green, for method of producing black coloring matters or pigments.

The same is marked Defendants' Exhibit Green English Patent.

English patent No. 1902 of 1863, to R. A. Brooman, for dyeing mixed fabrics.

The same is marked Defendants' Exhibit Brooman English Patent.

English patent No. 2336 of 1864, to Michael Henry, for improvement in dyeing and tanning and in preparing for dyeing and tanning.

The same is marked Defendants' Exhibit Henry English Patent.

English patent No. 1145 of 1777, to Anthony Mikovinij, for composition for dressing and bleaching hemp, flax, &c.

The same is marked Defendants' Exhibit Mikovinij English Patent.

The witness, upon reading the testimony, states as follows:

Counsel for the defendant got me rather muddled at ques-
216 tions 23 and 24, and in my answers I should have said, "I don't know which you refer to," in answer to question 23, and in answer to question 24, "I am willing to, but I don't know which you refer to."

Mr. Hudson reads cross-examination as follows:

X Q. 79. Mr. Underwood, you have told us in your direct examination about having used deliquescent salts with driers from 1880 down to the latter part of 1884 or early in 1885, and also that the salts of your patent, or some of them, are deliquescent salts; yet you claim to have made an invention or discovery in the thing patented. Will you please to explain what would seem paradoxical in your testimony? Tell us succinctly just what the difference is between what you did before and what you did after in the way of the use of deliquescent salts in making the composition?

A. I testified that some of the salts in the patent were deliques-
cent, but any of these deliquescent salts when used to form
217 the precipitate become non-deliquescent. When we used the deliquescent salts that I have testified to using, we used them

in combination with the precipitate, and not to form the precipitate. To my idea our invention lay in the discovery that precipitates of dye matter could be used alone without deliquescent salts. The fact is well known to any chemist that precipitates thus made would not be deliquescent of themselves.

X Q. 80. Then, if I understand you correctly, before the latter part of 1884 you used salts that were deliquescent in making a precipitate from the extract of logwood and then, after having obtained that precipitate, added to it in the oleaginous compound other or more deliquescent salts, and that you deemed such addition necessary until you subsequently discovered that you could dispense with the use of such additional deliquescent salts. Are these the facts?

(Counsel for defendants objects to the question as leading and immaterial.)

A. In answering that I would say that we did not necessarily use deliquescent salts to form our precipitate, but, having formed our precipitate, used the deliquescent salts with the precipitate, oil, *et cetera*.

Mr. v. Briesen reads redirect examination:

R. D. Q. 81. You used before 1884 that which your patent calls for, and in addition thereto in the mixture some deliquescent salt. Is that it?

A. We used the precipitate that our patent calls for with the addition of these deliquescent salts, which salts acted most materially on our precipitate.

R. D. Q. 82. Therefore, if I understand you right, any one
218 who uses what your patent calls for, but in addition thereto a deliquescent salt, does not use what your patent seeks to cover. Am I right?

(Counsel for complainants objects to the question as one for the court rather than a witness, being a question as to the scope of the patent, which ought to be answered upon all the evidence of the case and not according to the opinion of a single witness.)

A. I am not a patent attorney and do not see how I can rightly answer that question, but if a person used the same combination that we used the article would not be marketable becauses of the changes of the atmosphere.

R. D. Q. 83. What do you understand by a deliquescent salt?

A. A deliquescent salt is one which will attract moisture from the atmosphere, and which will also in warm weather be dried up by the same.

R. D. Q. 84. Is ferrocyanide of iron a deliquescent salt?

A. I am not certain, but I think I answered before that ferrocyanide of iron was not in any manner, shape, or form a deliquescent salt.

R. D. Q. 85. Does it not attract moisture from the atmosphere?

A. Not to any perceptible degree.

R. D. Q. 86. That was not my question. "Does it not attract moisture from the atmosphere?" is my question.

A. I could not swear that it did not; in fact, I very much doubt whether it does.

R. D. Q. 87. In securing your patent, or rather in seeking it, why did you not state that the mixture there described should be used without the addition thereto of a deliquescent salt, and that that was the essential phase of your discovery?

A. No one by reading the patent would think of using a
219 deliquescent salt in combination with the dye matter, and in describing a patent generally you do not say what not to use but what to use.

(Defendants' counsel objects to the answer as not responsive.)

R. D. Q. 88. I understood you, Mr. Underwood, to testify that the precipitate described in your patent, when mixed with oleaginous matter and also with a deliquescent salt, as you call it, was old and not what you sought to patent, but that you sought to patent the elimination from this old mixture of the deliquescent salt—the omission merely of matter formerly used; that was your invention, if I understood you correctly. Why did you not so state in your patent?

A. We did not in our patent describe an invention using deliquescent salts, as it would not have been a perfect article, but we did not see any reason to describe in our patent all the various experiments we had been through before, nor do I think that any patentee ever does so.

R. D. Q. 89. What is the effect of a deliquescent salt in the mixture of your patent?

A. It all depends what deliquescent salt you use.

R. D. Q. 90. Well, take those you used.

A. They had the effect of making the paper in dry weather become too dry to use; in wet weather to become smutty, soft, and otherwise changed.

R. D. Q. 91. And you mean to state that the attraction of water by the deliquescent salt to the mixture which is held in oleaginous matter would cause the water to enter the mixture. Is that your testimony?

A. It would cause the reproducing paper in damp weather to become limpy and soft.

R. D. Q. 92. Has not damp weather the same effect last described by you upon defendants' paper?

A. It has not.

R. D. Q. 93. Have you tried it?

220 A. I analyzed defendants' paper—not a quantitative analysis—and am therefore pretty certain that it would not.

R. D. Q. 94. You haven't answered my question. I didn't ask you whether you analyzed it or not; I asked you whether you tried it to ascertain whether defendants' paper became limpy in moist weather.

A. Having analyzed it, chemically speaking, it is impossible for it to become damp.

R. D. Q. 95. Does a deliquescent salt when used in addition to your mixture enter into the chemical combination of the mixture or join it without entering into such combination?

A. It enters into the chemical combination of the mixture.

R. D. Q. 96. Does it modify the color?

A. With some deliquescent salts used it would.

R. D. Q. 97. I again ask you to state what deliquescent salts were used by you in the paper you sold in 1883 and before.

A. We used all sorts of deliquescent salts, but the ones best suited for the purpose we used then were nitrate of potash and nitrate of soda.

R. D. Q. 98. Please state more fully how you used the nitrate of soda.

A. I objected to state the deliquescent salts, as you could see by my manner, for the reason I before stated; to give further information in that way I must decline.

R. D. Q. 99. Did you use the nitrate of soda by adding it to the precipitate of logwood extract before you mixed the oil or afterwards?

A. Sometimes before, sometimes afterwards.

R. D. Q. 100. And did you sometimes add it to the extract of logwood before you formed the precipitate?

A. I did not.

Mr. Hudson reads recross-examination:

221 R. C. Q. 101. These deliquescent salts, nitrate of soda and nitrate of potash, are, as I understand, the salts that you desired not to disclose when examined in chief at the last sitting, are they?

A. Yes; they are the ones.

Redirect by counsel for defendants.

By Mr. v. BRIESEN:

R. D. Q. 102. When did you first stamp the paper which is made under the patent in suit "patented"?

(Counsel for complainants objects to the question as immaterial.)

A. I do not know.

R. D. Q. 103. Is it not true that you first so stamped it after this suit was commenced?

A. I am not certain, but I am pretty confident it was stamped before. I could almost swear it was stamped before the suit was commenced; I mean stamped "patented." My brother could probably give you the exact date.

R. D. Q. 104. Did you ever notify defendants of the infringement?

A. We did.

R. D. Q. 105. How?

A. Our attorneys did.

R. D. Q. 106. How and when?

A. I believe it is all on file. I don't remember the exact dates, but it is all placed on file. I believe they were notified by registered mail.

(Counsel for defendants calls for proof of such notice, if any given.)

(Counsel for complainants states that he is not the attorney
222 referred to by witness, and his attention not having been directed to this matter, no notice to produce being given, he is not prepared at the moment to comply with the request, but will make inquiry concerning the matter that it may be disposed of at a future sitting.)

F. W. UNDERWOOD.

Sworn to before me—

HENRY L. BRANT,
Special Examiner.

Mr. BRIESEN reads testimony of Dr. T. O'CONNOR SLOAN, a witness called on part of the defendants.

Q. 1. What is your name, age, residence, and occupation?

A. My name is T. O'Conor Sloan. I am thirty-six years of age. I reside in South Orange, New Jersey. My business address is 361 Broadway, New York city. By occupation I am a chemist and engineer. I am a graduate of the School of Mines of Columbia College, in this city, from which institution I received the degree of engineer of mines in 1872 and some years later the degree of doctor
223 of philosophy. After leaving that college I occupied successively positions as chemist for the New York Gas Light Company, then of this city, and subsequently chief engineer of the Citizens' Gas Light Company of Brooklyn. After leaving the latter position I opened a laboratory for chemical analysis and investigation at 119 Pearl street, in this city, where for some years I executed a very varied range of work in chemical analyses and investious.

About six years ago my attention began to be directed to patents and the study of matter relating thereto. This work was continued for the purpose of preparing myself to testify in suits in which patents were the subject of controversy. During this period I have testified in a very large number of suits involving a very varied class of subjects. Most of these suits were tried in the U. S. circuit courts in this or adjacent circuits.

Q. 2. Have you read and do you understand complainants' patent here in suit, namely, patent No. 348,073?

A. I have read a copy of such letters patent, an exhibit in this case. I believe I understand it.

Q. 3. I observe in the claim of that patent the words "a sheet of material or fabric." What does the specification of the patent state in support of those words of the claim?

A. In the specification of the patent I find several clauses explana-

tory of the words of the claim which you have mentioned. The specification states: "Our invention relates to an improved reproducing surface adapted to be employed for obtaining copies of typewriting or other printed or written impressions by means of a typewriter or other printing device or by the employment of a stylus or other writing means. Our improved transfer surface is spread upon a sheet or vehicle, and when so applied is adapted to be employed
224 in place of the article of trade commonly known and described as 'carbon paper' or 'semi-carbon paper,' which are employed by typewriters and others to produce copies of impressions either obtained by a machine or a stylus or other writing means." This portion of the specification in its effect upon the claim tends to broaden to the utmost the words thereof "sheet of material or fabric." It says that the transfer surface may be spread upon a sheet or vehicle adapted to perform certain functions. This word "vehicle" is a term of very wide meaning, and, interpreting the claim in the light of the use of such word, it would certainly be very broad as regards the meaning of "a sheet of material or fabric." It is hard to say what surface could not be called a vehicle.

Q. 4. What would be a proper vehicle for the alleged improved transfer surface, if the same is to be used as the specification states for obtaining copies by means of printing device?

(Counsel for complainants objects to the question on the ground that the witness has not shown any knowledge either of printing or of so-called carbon papers, and hence is not qualified, so far as the record shows, to express an opinion under the questions asked.)

A. When copies are obtained by means of a printing device, literally speaking, the face of the type would afford a vehicle for receiving the printing composition.

Q. 5. Where the specification speaks of transfer surface being "spread upon," and so on, do you understand by "transfer surface" the composition or what?

A. I should understand by "transfer surface" the inking composition and mixture of coloring matter and oleaginous matter.

Q. 6. Have you read the testimony given in this cause by Professor Morton and by Messrs. John T. and F. W. Underwood; also by the witnesses Smith and Fernald?

225 A. I have.

Q. 7. Assuming it to be true, as Messrs. Smith and Fernald testify, that carbon paper previous to 1884 had been prepared by mixing a pigment such as lampblack with oil and wax, what new invention on that assumption alone would you find described in complainants' patent in suit?

A. Excluding entirely the state of the art and taking the naked facts just as you have stated them, I fail to see where invention would be exercised in substituting for carbon a known pigment.

Q. 8. In the oleaginous mixture, you mean?

A. Yes; in the oleaginous mixture.

Q. 9. How long, to your knowledge, has precipitate of dye matter been known as a pigment or coloring substance?

A. Those things are matters of history and I should think we could go back, historically, some two thousand years or more and find records of such materials. All the books and treatises are full of instances.

Q. 10. Assuming that precipitate of dye matter produced by precipitating a solution of extract of logwood with the aid of a mineral salt or alkali was known in 1884, what invention, if any, do you find disclosed in complainants' patent in suit, in view of English patent No. 2972 of 1806, which is now before you?

A. The English patent now before me contains the following passage at the beginning of the descriptive portion of its specification:

"In writing by this mode I make use of a prepared paper which I call duplicate paper. This is made by thinly smearing over any kind of thin paper with any kind of oil, preferring those kinds of oil which are least liable to oxygenizement or to be evaporated by heat. The ink made use of in this mode of writing consists of carbon or any other coloring substance, and finely levigated in any kind of oil. This ink is to be evenly spread on leaves of thin
226 paper or any other thin substance, after which it should remain for five or six weeks or any short period betwixt sheets of absorbent or blotting paper, after which it is fit for use—this I call carbonated paper—or coloring matter of any kind and in any other medium or verticle (evidently meaning "vehicle") may be used, provided that medium be such as will admit of the coloring matter being transferred to the duplicate and writing paper. * * * The pens or styles used are made of agate, ground and polished to a smooth round point. * * * To write singly in this mode I lay a leaf of the carbonated paper upon a smooth tablet of metal or any other smooth substance, and over that I lay a leaf of duplicate paper. Upon these I write with the styles, the pressure used causing a transfer of the carbon to be made upon the under side of the duplicate paper, which, being transparent, instantly appears through as if written upon the paper."

The specification then goes on to enlarge upon writing with several sheets and describes also the use of types. These types, the specification states, may be rubbed with a little beeswax, softened with oil or any concrete fatty substance to prevent shifting.

Towards the end of the specification I further quote:

"This stereotype tablet may be used the same as any other type in the common mode of printing and with a common press, observing always in printing to place the character paper so as that the squares thereof and those of the type tablet shall perfectly correspond and meet line for line when pressed upon each other, or leaves of thin character paper and carbonated paper may be laid alternately upon each other, and upon this the stereotyped tablet is pressed in any manner found most convenient. By this means, with a single pressure, a multiplicity of impressions are formed at once. To write with the new characters I take one, two, or
227 even six layers of duplicate paper on which is stamped or printed the basis of the letters. Betwixt every two leaves I

lay a leaf of carbonated paper, and over all I lay the type tablet, each square of which must be exactly over the squares or figures in the character paper so arranged, and when thus laid with the point of a metal or other hard pointed style I press down each type which I may require to form or (probably meaning a) word, from which act six copies are produced on the papers underneath, and when the types are fixed, as before directed with lead, a stereotyped tablet is formed, from which other impressions may be printed in any quantity."

In this patent, therefore, is found described a carbon transfer paper consisting of paper covered with a mixture of carbon or any other coloring substance with any kind of oil. It is to be used exactly as the carbon papers of the present day are used, either for the production from type, as on the typewriter, or reproduction with a hard stylus. Any number of sheets are to be reproduced by it. It even illustrates incidentally the mixture of beeswax and oil. One especial point to be made is that in this patent carbon or any other coloring substances are treated as equivalents, as pigments to be mixed with any kind of oil. This equivalency, thus indicated over eighty years ago in connection with the other matter disclosed in this English patent, to my mind operates to strip the matter of the patent in suit of the character of invention.

(Counsel for complainants, in view of the last part of the answer of the witness, calls attention of defendants' counsel to his statement of the sole purpose for which these English patents were introduced.)

Q. 11. Will you kindly look at English patent No. 342 of
228 1856, and state how what is there described compares with the alleged invention of the complainants' patent in suit?

A. In the English patent to which you have referred me I find described the treatment of logwood extract with metallic salts, some being what are known as acid and others what are known as alkaline salts, one of the compounds named being a solution of alkali, namely, spirits of ammonia. Vinegar and other acid substances are also included. In this way the patentee proposes to obtain a liquid coloring matter, the fluid being strained or otherwise purified. He then states that he may obtain the said coloring matter in a solid form by combining the aforesaid salts with a solid preparation of extract of logwood or by evaporation or distillation from the liquid coloring matter above described. The coloring fluid which he obtains he proposes, if desirable, to convert into a copying fluid by the addition of any saccharine or other thickening ingredient hitherto employed. The salts he proposes to employ not singly but in a mixture.

Thus this patent illustrates the treatment of a dye-wood solution with alkali and mineral salts; also with alkali, acid substances, and mineral salts, and therefore strips such treatment of the character of invention, were such at all necessary or required in view of the state of the art as known to every one at all conversant with the sub-

ject of dyeing. Such treatment I find described in the patent in suit between the 25th and 35th lines of the specification.

Q. 12. I now call your attention to English patent No. 1354 of 1863, more particularly to the first claim of said patent and to that part of the specification which describes the preparation of a precipitate from logwood extract, and ask you how what is there described compares with complainants' patent here in suit.

A. The English patent referred to and now before me is devoted largely to the treatment of logwood extract; in the more specific portion of the patent he describes accurately one of his methods of using logwood. This portion I shall now quote:

229 "I take a clarified extract thereof containing one pound to every gallon, which should be of the strength of one degree by Twaddle's hydrometer, to each gallon of which I will mix four ounces of China clay or other base; I then add at the rate of a quarter of a pound of copperas to each gallon, which I use in a clarified solution, as described in the first part of the specification. I then allow the precipitate to subside, wash and dry, as also hereinbefore described."

Following as nearly as possible the words of the patent in suit, I find that this describes the treatment of a dye-wood solution containing its active principles which is clarified, presumably by filtration, and which is precipitated with a mineral salt. This English patent, therefore, in the clause quoted, describes almost exactly that portion of the specification of the patent in suit contained between the 25th and 35th lines of the specification. Then in the claim of the English patent is claimed in words as follows:

"The production of black pigments by the precipitation of the coloring matter of myrabolanes, galls, logwood, tannin, and such other materials as are used in the manufacture of black writing inks and in dyeing black in conjunction with the mordants that are used for such purpose, and the application of such pigments, when dried, to the purposes for which smoke, vegetable, and such blacks are capable of being used, either alone or in admixture with the blacks of commerce."

The claim, therefore, contemplates broadly the precipitation of coloring matter and also speaks, as will be noticed, of the pigments thus produced being dried, thus bringing in another of the steps of this subsidiary process of the patent in suit.

230 In the beginning of his specification the English patentee Green alludes to what he terms the present methods of producing black coloring matters or pigments, "present," of course, referring to a period about twenty-five years ago. These methods include in general the production of carbonaceous compounds, such as lampblack, charcoal, bone-black, and so forth. In all these compounds carbon is the principal or only cause of blackness. The patentee then states that the object of his invention is to procure blue or jet blacks by more strictly chemical means, using such materials as are used in the manufacturing of black writing inks and in dyeing blacks, such as myrabolanes, galls, logwood, and the various tanning matters. The method or mode of proceeding which

he adopts he declares to be the precipitation of the coloring matters of the said materials in conjunction with those chemicals or mordants that are known to strike a black therewith. The precipitation he brings about by the use of mordants in the broad sense; thus he describes the use of sulphate of copper and logwood with an alkali or some of the salts of the alkalies as a mordant and basis. He speaks of the mixing these precipitates with oil; of the use of more than one mordant, such as sulphate of iron, with some of the salts of lead or potash. He speaks of the addition of an alkali or an alkaline earth to be added after the copperas or other mordant. He leaves quantities largely to the discretion of the workman.

In his treatment of cutch or tanning matters he uses pearl ash, followed by nitrate of iron.

In this patent therefore we find the use of acids and alkaline salts as precipitants described in the broadest way, and we find the use of precipitates produced thereby as a basis of coloring to be mixed with *with* oil also described, thus leaving little or nothing of invention in the patent in suit, however constructed.

231 Q. 13. In view of patents 11544 of 1847, 1988 of 1857, 985 of 1860, 3021 of 1861, and 2336 of 1864, which I now hand you, does it appear that the complainants had invented the use of precipitate of logwood as dye matter or coloring matter?

(Complainants' counsel objects to the question as immaterial and irrelevant.)

A. The English patent No. 11544 of 1847 describes the obtaining of a substance of coloring matter from extract of logwood by the action of nitric acid thereon. This therefore shows that the preparation of coloring matter from extract of logwood by treatment with acid is old.

The English patent No. 1988 of 1857 treats of the preparation of pigment from dye-wood extracts by treatment with persulphate of tin. The patentee also includes treatment of the wood with alkaline solutions, to be followed by treatment with oxide of tin or other oxide or salt. This patent therefore shows that the treatment of dye-wood extracts with these chemicals is old.

The English patent 985 of 1860 describes the treatment of logwood extract with metallic salts or mordants, either alone or mixed, affording additional illustration of the prior existence of this method of treating logwood extract.

The provisional specification No. 3021 of 1861 describes the employment of a decoction of logwood, which is equivalent to logwood extract, with caustic soda, illustrating the treatment of a dye-wood extract with an alkali, and the provisional English specification No. 2336 of 1864 describes dyeing and printing compounds that include broadly treatment of wood extracts with acids and

232 salts of various character, affording additional illustration of substantially the same thing, namely, the prior use of wood extracts and chemical mordants in the preparation of coloring matter.

Q. 14. Do you understand the complainants' patent in suit to be limited to the preparation of any particular color, such as black?

A. The patent, in terms, says nothing about color, and on its face is certainly not limited to a black color.

Q. 15. How does the complainants' patent in suit compare with the prior patent, No. 348,072, to the same patentees, namely, Defendants' Exhibit Underwood's Prior Patent?

(Complainants' counsel objects to the question as immaterial and irrelevant.)

A. I find the same alleged invention described in each.

Q. 16. Does the difference, if any, between the claims of the two patents mark, in your opinion, the exercise of inventive genius?

A. It certainly does not.

Q. 17. Why not?

A. Because, in view of the most general knowledge of the existence of such things as carbon paper, invention was not exercised in spreading the oleaginous pigment of the Underwood prior patent upon a piece of paper for copying purposes

Q. 18. Is it also true that the Underwood prior patent distinctly describes such spreading of oleaginous pigment upon the paper?

A. It does; and that is what I alluded to in answer to question No. 15.

Q. 19. What oleaginous matter do you understand to be referred to in the claim of the complainants' patent here in suit? Before answering this question please let me read you questions and answers Nos. 137, 138, 139, and 144 from the deposition of Mr. John T. Underwood.

233 (Defendants' counsel reads the questions and answers referred to.)

A. According to the interpretation placed upon the patent by the witness in the answers you have read to me no restriction to any particular variety of oleaginous matter is contained in the patent. This view is fortified by the words of the claim, which read, "in combination with oil, wax, or oleaginous matter."

Q. 20. Do you agree with Professor Morton in that part of his testimony in which he endeavors to maintain the patentability of complainants' alleged invention by reference to the proportions of oil and wax given, in order to distinguish the mixture of the patent from printing ink?

(Complainants' counsel objects to the question unless the parts of the evidence referred to in it be indicated. This is necessary in fairness to the witness as well as to counsel when the time for cross-examination comes.)

(Defendants' counsel directs the witness to questions and answers Nos. 17, 18, 19, 22, and 38 of Professor Morton's cross-examination and reads the same to the witness in the following order: 38, 17, 18, 19, 22.)

(To the objections already stated after the questions had been read,

complainants' counsel objects to so much of the question as assumes to state the purpose or purport of the testimony of Professor Morton, as that is involved in the answers.)

A. I do not see that the question of proportions, as brought
234 out by Professor Morton, affects the presence or absence of invention in the patent in suit. I fail to see where invention comes in in the settlement of conveniently workable proportions of a pigment and oleaginous matter.

Q. 21. It being admitted by Mr. Underwood in the testimony heretofore read to you that the mixture of oil and wax with lampblack and other dry coloring matter for use on carbon paper was known and practised at least thirty years ago, and it being shown that the precipitate of dye matter was a known pigment more than thirty years ago, would it require the exercise of inventive genius, in your opinion, even if new, to mix such a precipitate with such an old carrier thereof on paper?

(Complainants' counsel objects to the question as immaterial, irrelevant, and as calling for the determination of questions that more properly belong to the court on facts to be adduced than to the witness as an expert chemist.)

A. I do not think it would require the exercise of the least invention to do so.

Q. 22. Does the pigment which is added to the mixture of oil and wax modify or affect in any manner the said oil and wax?

(The question is objected to by complainants' counsel as indefinite in the use of the word "pigment.")

A. The coloring matter prescribed in the patent in suit, to the best of my knowledge, is without effect upon the oleaginous material with which it is mixed, as it is a mechanical mixture and not a chemical combination.

Q. 23. Isn't this fact demonstrated by the analysis testified to by Professor Morton?

A. As far as the analysis demonstrates anything it demonstrates this.

235 Q. 24. Does the oil and wax mixture affect or produce any change in the precipitate of dye matter which is added to it?

A. The dye matter is unchanged and not affected by the oil.

Q. 25 What is the object of the oil and wax as used on carbon papers?

—. As I understand it, it is for the purpose of affording a somewhat adhesive material to hold the coloring matter in more or less firm attachment to the surface of the copying paper, the object being to retain it with such firmness that some little force is required to detach it; where the stylus is used the increased pressure beneath the point of the stylus operates to transfer more or less of the composition to the paper or other surface beneath; in the intermediate points between the stylus lines the pressure produced is so slight that the force is not enough to produce the transfer; a certain

amount of adherence, of course, is required to make the copy permanent.

Q. 26. It is not the intention in the use of carbon paper, the same as when printers' ink is employed, that the matter transferred shall stay and remain where put?

(Complainants' counsel objects to the question as leading, and further objects to it as indefinite and uncertain in that it fails to indicate whose intention it is that is inquired after.)

A. I so understand it.

Q. 27. Is it or not a fact that the degree of pressure employed with printers' ink or on carbon paper will determine whether the whole or part of the oleaginous pigment pressed will be transferred?

(Complainants' counsel objects to the question on the ground that the witness is not shown to be an expert in the manufacture or use of printers' ink.)

236 A. The amount transferred will depend upon the pressure produced. It is hardly possible for all to be transferred.

(Counsel for defendants offers in evidence United States letters patent No. 89738 of May 4, 1869, to Charles Cowan, for preparation of copying paper, and the same is marked "Defendants' Exhibit Cowan Patent."

Also U. S. patent No. 47494 of April 25, 1865, to Horace Holt, for composition for preparing ribbons for hand stamps, and the same is marked "Defendants' Exhibit Holt Patent."

Also U. S. letters patent No. 239,954 of April 12, 1881, to John Hendrichs, for base for safety lithographic inks, and the same is marked "Defendants' Exhibit Hendrichs Patent."

Also U. S. letters patent No. 198,090 of December 11, 1877, to Charles C. Egerton, for inks for cancelling, and the same is marked "Defendants' Exhibit Egerton Patent."

Q. 28. Please examine the American patents of Cowan, Holt, Hendrichs, and Egerton, and state how they affect, if at all, the invention sought to be covered by complainants' patent in suit.

(An examination of the answer in this suit having disclosed that the Cowan patent is the only one of the four which is therein mentioned, counsel for complainants consents that the other three
237 may be considered as if mentioned in the answer, and that the answer may be amended by inserting them if defendants' counsel desires so to do.)

A. The Egerton patent discloses a cancelling ink. This is an ink to be transferred by some cancelling apparatus to the surface of postage stamps. The ink contains, among other ingredients, indigo and aniline. The indigo represents an insoluble dye precipitate, and the patentee contemplates and states in words that for the indigo printers' ink or other material containing carbon may be used. This patent therefore affords an example of the treatment of car-

bon and an organic dye precipitate as equivalents for pigmentary use in 1877.

The Hendrichs patent, which application was filed in 1880, describes a base for safety lithographic inks, which consists of a mixture of logwood extract and other substances, among which are copperas (protosulphate of iron), flowers of sulphur and bichromate of potash; some drop-white is also included. This base the patentee contemplates grinding with some ordinary printers' or lithographers' varnish. He states: "Ink made from my improved base may be produced at a less expense than lithographers' ink now commonly used." The lithographers' ink now commonly used, to which he refers, of course is ink made with lampblack or carbon as the base of coloration. The patent illustrates the substitution in a lithographers' ink of a dye pigment for carbon.

The Holt patent, dated April 25, 1865, is for a composition for hand-stamp ribbons. The patentee states that ordinary printing ink has been used in preparing such ribbons. For such printing ink he proposes to substitute a solution of aniline red or any other of the well-known aniline colors, in glycerine or any other
238 fatty material known as a solvent of such color or colors. This patent illustrates the substitution for a printers' ink of a coal-tar color dissolved in a fatty medium.

The Cowan patent, dated May 4, 1869, describes the preparation of copying paper. Various oils or oleaginous substances, spirits of turpentine, and beeswax are used in this preparation. The coloring matters are ground with pure olive oil, spirits of turpentine, and beeswax. For coloring matter Cowan uses various pigments, among which may be noted carmine. This patent, therefore, shows the use of organic coloring matter or dye precipitate with oleaginous matter, including beeswax, as a coating for copying paper.

As regards the comparison asked for in your question, these patents all go to prove the same lack of invention in the composition and preparation described in the patent in suit.

Q. 29. Have you read the article entitled "Logwood inks," in volume 35 of the Scientific American of August 12, 1876, page 101; and, if so, will you compare the description of the inks there given with what is described in complainants' patent in suit?

239 A. I have read the article referred to as included in the typewritten record in this case, and I have now before me the original article in the Scientific American of August 12, 1876. In the ink described in the article in Scientific American the coloring matter of logwood is used as the coloring matter for a fluid ink. Extract of logwood in this preparation is treated with crystal-ized carbonate of sodium and neutral chromate of potassium.

Other inks are described in which the coloring matter is prepared from logwood extract or from decoction of logwood, the mordant or salt for developing the coloring matter being neutral chromate of potassium, chrome alum, ammonia alum, or sulphate of copper. One of these inks on being exposed to the air produces a precipitate. The article also states that in the oxidized solution of the coloring

matter of logwood a precipitate of a black or bluish black color is produced by metallic salts.

From all this it appears that the production of coloring matter and of coloring precipitates from logwood extract by metallic salts was old or was known in the year 1876, eight years before the date of the patent in suit. This article in the Scientific American therefore covers the general idea of preparing a coloring matter from logwood extract by acting upon it by metallic salts.

We find the addition to logwood extract of soda followed by a mineral salt, the salts of iron or copper being specified. In the Scientific American we find the same in general terms—crys-
240 tallized carbonate of sodium, commonly known as soda, along with a metallic salt, the neutral chromate of potassium being added to a solution of extract of logwood. The metallic salt is chromate of potassium and not a salt of iron or copper. But later on in the article sulphate of copper or sulphate of iron is prescribed in terms as a metallic salt to be used in preparing such inks.

Q. 30. Is there anything in the Scientific American article to which you have referred that appears to render the use of a deliquescent salt obnoxious to the processes there described in the sense in which Mr. F. W. Underwood claims in his testimony that the absence of deliquescent salts from his patented mixture is an important invention?

(Objected to as not stating the substance of Mr. Underwood's testimony as the same is understood by complainants' counsel. A further objection is that it calls upon the witness to construe the testimony of the witness Underwood by the use of the word "sense" in the question.)

A. In the article in the Scientific American I find nothing said about deliquescent salts as such and the principal salts named are not deliquescent ones. In the principal formula given carbonate of sodium and neutral c-romate of potassium are used. Neither of these is deliquescent.

Q. 31. What I desire to know, Doctor, to put it in other words, is as follows: Supposing it to be true, as Mr. Underwood testifies, that in former years he produced a precipitate of dye matter substantially as described in his patent, then added to such precipitate a deliquescent salt, and then mixed them, and added to this mixture the oleaginous carrier thereof; and supposing it to be true also,
241 as Mr. Underwood testifies, that in the latter part of the year 1884 or early in 1885 he discovered for the first time, so far as his knowledge goes, that the deliquescent salt might be profitably omitted, how does the article in the Scientific American compare with that alleged step in Mr. Underwood's invention? Does it describe the addition of a deliquescent salt to the precipitate, or does it already show in 1876 that such a deliquescent salt was not added to the precipitate?

(Complainants' counsel objects to the question as leading.)

A. The article in the Scientific American shows the formation of

precipitates of coloring matter of logwood produced by the addition to its decoction or extract of metallic salts, and these precipitates have added to them no deliquescent salts, indicating that the production of such precipitates without such specific additions was known in 1876.

Q. 32. How do the substances called lakes compare with precipitates of dye matter as described in the complainants' patent in suit?

(Complainants' counsel objects to the question as immaterial.)

A. The broadest or most complete definition of lakes which I could give would be in general terms the precipitate of the coloring matter derived from plants, plant products, insect or insect products, and, as far as the definition goes, perhaps also from animal products, by the addition thereto of salts which would combine with said coloring matter as to form the colored precipitates in question. As a general rule, but perhaps not as an exclusive definition, the precipitate as regards its mineral constituents would be of a more basic nature than salt originally added. Thus in the addition to a carmine solution of a salt of alumina, followed or accom-
242 panied by the addition thereto of an alkaline salt, the precipitate would be more basic than the original alumina salt used. This method of precipitating organic coloring matter I find illustrated in the patent in suit, where to a solution of organic coloring matter soda and sulphate of copper are added. The soda reacting on the sulphate of copper in the presence of the logwood extract produces a salt of copper of basic properties which carries down the coloring matter, thus producing in the broad sense a lake.

Different lakes will be found mentioned in commerce, such as the different carmine lakes prepared from the coloring matter of the cochineal spider; madder lakes, prepared from the coloring matter of the madder plant, and many other examples could doubtless be cited by one more familiar with the trade than I am.

As a matter of common knowledge, lakes have been known, have appeared in commerce, and have been used for a great many years. As a vehicle for their application they are mixed with oleaginous matter, and, as a matter of common knowledge, this mixture is also very old.

Q. 33. Does the article which the record contains, and which is copied from Ure's Dictionary, confirm or not what you have just stated about lakes? I call your attention more particularly to the portion of said article which begins with the following words: "If we mix a clear infusion of a dye with a small quantity of a solution of an earthy or metallic salt, both in water, the limpid liquids soom become turbid, and there gradually subsides, sooner or later, according to the nature of the mixture, a colored precipitate, consisting of the altered dye united with a basic or subsalt," and ending with that paragraph which begins with the words, Such lakes are the difficultly soluble salts which constitute the dyeing materials of stuffs.

243 A. The part of the article you have referred to appears to confirm very strongly the view which I have expressed. It

develops the idea of the basic nature of the metallic base of lake precipitates very clearly. As a popular statement of the formation of coloring precipitates from organic bodies the article may with profit be read at length. The date of the publication from which the quotation is made should also be noted as indicating the antiquity of this knowledge of the formation of lakes.

T. O'CONOR SLOANE, *Ph. S.*

Sworn to before me—

HENRY L. BRANT,
Spec. Exam'r.

(Counsel for defendants states that he has but one other witness to call, who will testify that precipitates of dye matter and lakes have been on sale in this country for more than ten years last past, and that they were sold as pigments in a dry condition, and were also sold to customers mixed with such oils as customers demanded; and thereupon it was stipulated by and between counsel for the respective parties that Doctor I. W. Drummond, chemist of Devoe & Co., if called as a witness, would testify as above set forth, and this stipulation is taken in lieu of such testimony, and with the same force and effect that such testimony could have in the case.)

244 (Counsel for defendants offers in evidence from Dick's Encyclopedia of Practical Receipts and Processes, published — New York, 1883, the article entitled "Inks," appearing on pages 231 to 237, inclusive, which article is in terms as follows, to wit:)

"Inks.—Writing inks might be included under the general term of liquid coloring matters were it not that they require to have the special characteristics of brilliance, permanence, and some degree of indestructibility, combined with perfect fluidity, in order to fulfil the objects for which they are generally used. Printing and lithographic and other inks are also included under this heading.

"2461. Black ink.—According to the most accurate experiments on the preparation of black ink, it appears that the quantity of sulphate of iron should not exceed $\frac{1}{3}$ part of that of the galls, by which an excess of coloring matter, which is necessary for the durability of the black, is preserved in the liquid. Gum, by shielding the writing from the action of the air, tends to preserve the color, but if much is employed the ink flows badly from quill pens and scarcely at all from steel pens. The latter require a very limpid ink. The addition of sugar increases the flowing property of ink, but
245 makes it dry more slowly, and frequently passes into vinegar, when it acts injuriously on the pen. Vinegar, for a like reason, is not calculated for the fluid ingredient. The best blue galls should alone be employed in making ink. Sumach, logwood, and oak bark are frequently substituted for galls in the preparation of common ink. When such is the case only about one-sixth or one-seventh of their weight of copperas should be employed.

"2462. To prevent ink from moulding.—The addition of a few bruised cloves or a little oil of cloves or, still better, a few drops

of creosote will effectually prevent any tendency to mouldiness in ink.

"2463. Fine black ink.—Aleppo galls (well bruised), 4 ounces; clean soft water, 1 quart. Macerate in a clean, corked bottle for ten days or even longer, with frequent agitation; then add 1¼ ounces gum arabic (dissolved in a wineglassful of water); lump sugar, ½ ounce; mix well, and afterwards further add 1½ ounce- sulphate of iron (green copperas), crushed small; agitate occasionally for two or three days, when the ink may be decanted for use, but it is better if left to digest together for two or three weeks. When time is an object the whole of the ingredients may be at once put into a bottle and the latter agitated daily until the ink is made, and boiling water instead of cold water may be employed. The above will make 1 quart of beautiful ink, writing pale at first, but soon turning intensely black.

"2464. Cooley's superior black ink.—Bruised Aleppo nut-galls, twelve pounds; water, 6 gallons; boil in a copper vessel for one hour, adding water to make up for the portion lost by evaporation; strain and again boil the galls with water, 4 gallons, for ½ hour; strain off the liquor and boil a third time with water, 2½ gal-
246 lons, and strain; mix the several liquors, and while still hot add green copperas (sulphate of iron), coarsely powdered, 4 pounds; gum arabic, bruised small, 3½ pounds; agitate until dissolved, and when settled strain through a hair sieve and keep it in a bunged-up cask for use. This will produce 12 gallons, very fine and durable.

"This ink and that in No. 2463 are good. Cooley recommends them very highly. He says that they are very durable and limpid, and will bear dilution with nearly an equal bulk of water and still be superior in quality to ordinary inks. Of the latter ink he says that he has writing that was executed with this kind of ink upwards of 60 years ago which still possesses a good color.

"2465. Black ink.—Campeachy logwood chips, 3 pounds; bruised galls, 9 pounds; boil in water and to the mixed liquors add gum arabic and green copperas of each 4 pounds; to produce 16½ gallons of ink. Quality very good, but inferior to the above.

"2466. Asiatic black ink.—Logwood shavings and powdered galls of each 2 pounds; green vitrol, 1 pound; gum, ½ pound; pomegranate bark, ½ pound; water, 1 gallon; infuse 14 days with frequent agitation, or boil as directed in last receipt. This ink writes pale, but flows well from the pen and soon turns black.

"2467. Good black ink.—Bruised galls, 2 pounds; logwood, green copperas, and gum, of each 1 pound; water, 6 gallons; boil the whole of the ingredients in the water 1½ hours and strain 5 gallons. Good, but not fine.

"2468. Common black ink.—Bruise galls, 1 pound; logwood, 2 pounds; common gum, ¾ pound; green copperas, ½ pound; water, 5 gallons; boil. Common, but fit for ordinary purposes.

247 "2469. Exchequer ink.—Bruised galls, 40 pounds; gum, 10 pounds; green sulphate of iron, 9 pounds; soft water, 45

gallons; macerate for three weeks, employing frequent agitation. This ink will endure for centuries.

"2470. Black steel-pen ink.—A black ink, not corroding steel pens and neutral, may be prepared by digesting in an open vessel 42 ounces coarsely-powdered nut-galls, 15 ounces gum senegal, 18 ounces sulphate of iron (free from copper), 3 drachms aqua ammonia, 24 ounces alcohol, and 18 quarts distilled or rain water. Continue the digestion until the fluid has assumed a deep black color.

"2471. Glycerine ink.—Take copperas, 4 ounces; nut-galls, 12 ounces; logwood, 8 ounces; vinegar, 8 ounces; gum arabic, 1 ounce; glycerine, ½ ounce; water, 48 ounces; all the solid substances are to be pulverized and boiled for an hour together; they are then set to cool, strained through a flannel bag, and after that filtered through a folded filter; a drop of oil of cloves is added, the whole well shaken and filled into bottles. This ink will copy well.

"2472. Dr. Ure's ink.—For 12 gallons of ink take 12 pounds bruised galls, 5 pounds gum, 5 pounds green sulphate of iron, and 12 gallons rain water. Boil the galls with 9 gallons of the water for 3 hours, adding fresh water to supply that lost in vapor; let the decoction settle, and draw off the clear liquor; add to it the gum previously dissolved in 1½ gallons of water; dissolve the green vitrol separately in 1½ gallons of water and mix the whole.

"2473. Japan ink.—Aleppo galls, ½ pound; logwood chips and copperas each 4 ounces; gum arabic, 3 ounces; sugar, 1 ounce; blue vitrol (sulphate of copper) and sugar candy, each ½ ounce. Boil the galls and logwood in 6 quarts water till reduced ½; strain; add the other ingredients; stir until dissolved; clear and bottle. If it does not shine enough add more gum; also a few cloves to prevent mould.

"2474. Ink powder.—For an ink powder take 1 pound nut-galls, 7 ounces copperas, and 7 ounces gum arabic; pulverize and mix. This amount of ink powder will make 1 gallon of good black ink. Two or three powdered cloves should be mixed with each pound of powder to prevent moulding.

"2475. Permanence of ink.—The great difficulty with all iron inks is the precipitation which will take place after a longer or shorter time and which manufacturers have tried to obviate by substituting other materials. All inks, however, the basis of which is not tannate and gallate of iron are not black immediately, and consequently not so agreeable to the eye when using them. The alizarine or rather indigo inks have a greenish, the chromium inks a reddish hue, and are not better adapted to withstand chemical agents than iron inks are.

"2476. To keep ink from thickening.—The only way to keep writing ink thin with which we are acquainted is to protect it from the atmosphere. The air not only evaporates it, but oxidizes it and renders it thick. Those inkstands which have a tapering funnel in the mouth will preserve the ink in its normal state much longer than the ordinary kind, because less of the surface is exposed.

"2477. Writing fluids.—The very general use of steel pens has caused a corresponding demand for easy-flowing inks, many of

which have been of late years introduced under the title of 'writing fluids' or 'steel-pen inks.' These are mostly prepared from galls in the preceding manner, but a less quantity of gum is em-
249 ployed. The blue writing fluids, which either maintain their color or turn black by exposure, are prepared from the ferocyanide of potassium (prussiate of potassa) or from indigo.

"2478. Beautiful blue writing fluid.—Dissolve basic or soluble Prussian blue in pure water. This is the most permanent and beautiful ink known. It is not affected by the addition of alcohol, but is immediately precipitated by saline matter. The precipitate, however, still possesses the property of dissolving in pure water.

"2479. To test Prussian blue.—Pure Prussian blue feels light in the hand, adheres to the tongue, has a lively dark-blue color, and gives a smooth, deep trace. It should not effervesce with acids, as when adulterated with chalk, nor become pasty with boiling water, as when adulterated with starch. Prussian blue, rendered inferior in its color by an admixture of free oxide of iron, may be improved by digestion in dilute sulphuric or muriatic acid, washing, and drying. Its relative richness in the real ferroprussiate of iron may be estimated by the quantity of potash or soda which a given quantity of it requires to destroy its blue color.

"2480. Blue writing fluid.—Dissolve the soluble ferrocyanide of potassium and iron and pure water; resembles No. 2478, but is precipitated from its solution by alcohol.

"2481. Stephens' patent blue ink. Mr. Stephens' process.—Take Prussian blue (either of commerce or the pure chemical combination of sesqui-oxide of iron with ferrocyanide of potassium), put it into any earthen vessel and pour upon it as much strong hydrochloric, nitric, or sulphuric acid as will cover it (if sulphuric acid is used it must be diluted with an equal bulk of water); after
250 standing 48 hours or more add plenty of water, stirring it thoroughly to remove the salts of iron; let it stand till all color has subsided, then draw off the clear liquid with a syphon; add fresh water, and repeat the washing until ferrocyanide of potassium ceases to produce a blue precipitate and the water drawn off ceases to redden blue litmus paper, then filter the product. This treatment extracts much of the iron from the Prussian blue and takes away its liability to precipitate by long standing. Next add and carefully mix one part oxalic acid to every six parts of Prussian blue; then dilute by degrees with water sufficient to make the blue ink any desired tint. The influences of air and dampness have a tendency to destroy the color of manuscript written with black ink, while the same influences tend to deepen and increase the color of the Prussian blue ink. This ink is only affected by continued exposure to light, which makes it fade in some degree, but it completely recovers its original depth of color by being put in a dark place.

"2482. Mohr's blue writing fluid.—Titurate to a perfectly smooth paste 6 parts pure Prussian blue and 1 part oxalic acid, with a little water; then dilue with sufficient soft water to make it fluid.

"2483. Runge's black writing fluid.—This is a cheap and good

ink and resists ordinary destructive agents well; it is perfectly liquid, scarcely thickens by age, deposits no sediment, and does nor corrode steel pens. Digest ¼ pound logwood in fine chips for 12 hours in 3 pints boiling water; then simmer down gently to 1 quart, carefully avoiding dust, grease, and smoke; when cold, decant the decoction and dissolve in it by aggitation 20 grains yellow chromate of potash. It will then be fit for use.

"2484. Shellac ink; or, Coathupe's writing fluid.—To 18 ounces water add 1 ounce powdered borax and 2 ounces bruised
251 shellac and boil them in a covered vessel, stirring them occasionally till dissolved; filter, when cold, through coarse filtering paper; add 1 ounce of mucilage; boil for a few minutes, adding sufficient finely powdered indigo and lampblack to color it; leave the mixture for 2 or three hours for the coarser particles to subside; pour it off from the dregs and bottle it for use.

"2485. Arnold's writing fluid.—Arnold's writing fluid is a mixture of sulphate of indigo and ordinary ink; it flows freely from the pen, and at last becomes very black. On account of the large quantity of acid it contains it is very destructive to steel pens, and for this evil we know of no cure.

"2486. Blue fluid for making blue-black writing ink.—Prussian blue in fine powder, 1 ounce placed in a common phial and concentrated hydrochloric acid, 2 ounces poured over it; effervescence ensues, and the mixture soon assumes the consistence of a thin paste; after 24 hours it may be diluted with 8 or 9 ounces of water and preserved in a glass bottle; the intensity of this color may be lessened by water. It forms an excellent blue writing fluid.

"2487. Fine writing fluid.—Dissolve ceruleo-sulphate of potassa of ammonia (soluble indigo in hot water) and when cold decant the clear. It is an intense blue and dries nearly black; is perfectly incorrosive and very permanent and easy flowing. It may be thickened with gum water or diluted with pure rain water as required.

"2488. Read's patent blue writing fluid.—Prepare a solution of iodide of iron, from iodine, iron, and water; add to the solution half as much iodine as first used; pour this solution in a semi-saturated
solution of ferroprussiate of potash, containing nearly as much
252 of the salt as the whole weight of iodine; collect the precipitate, wash it, and finally dissolve it in water to form the blue ink. The solution from which the precipitate is separated, evaporated to dryness, and the residue fused, redissolved, and crystallized, yields pure iodide of potassa.

"2489. Indelible writing fluid.—To gall ink, add a strong solution of Reade's patent writing blue in distilled water. This addition makes the ink which was previously proof against alkalies equally proof against acids, and forms a writing fluid which cannot be erased from paper by any common method of fraudulent obliteration without the destruction of the paper. This ink writes greenish blue, but afterwards turns intensely black.

"2490. Precautions in making writing fluids.—All the preceding receipts for writing fluids under proper management produce excellent products. Care must be taken in all cases that the ingre-

dients be pure, and unless this precaution is attended to success is doubtful. Either of the preceding blue fluids may be used as indelible ink to mark linen, and will be found very permanent, provided the part be first moistened with alum water and dried.

"2481. Gold ink.—Gold ink is prepared in the following way: Genuine gold leaf is rubbed with honey on a plate of agate or ground glass by means of a flat pestle until the whole presents a uniform mass in which no distinct particles of gold can be recognized.

"(See No. 2517.)

"This mass is carefully removed into a vessel with water, which will dissolve the honey and leave the gold in an extremely disintegrated state behind. The water has, according to the size of the vessel, to be removed twice or three times, when all the sac-
253 charine matter will have been washed away. The remaining gold is then mixed with a sufficient quantity of a solution of gum arabic, shaken well, and is ready for use. (See No. 2518.) The writing is to be rubbed, after drying, with a flat piece of ivory, when it will present the lustre of pure gold.

"2492. Silver ink.—Silver ink is prepared in the same way from silver leaf as the gold in last receipt.

"2493. Gold labels on glass bottles.—The finely divided gold prepared as in No. 2591 is distributed in a solution of gum damar in naptha, and the writing is to be done with this fluid by means of a brush. If the solution should become too thick in course of time a little naptha is added and well shaken, when the gold paint will be ready for use again. The gum damar in drying will cover the written lines with a kind of varnish that will protect the gold from the action of acids or alkalies.

"2494. Purple ink, or king of purples.—Infuse 12 pounds campeachy logwood in 12 gallons water; provide a funnel at the bottom of which a sponge has been placed; pour the infusion through a strainer made of coarse flannel into the funnel, and thence onto 1 pound of hydrate or acetate of copper (verdigris); then add immediately 14 pounds of alum, and for each 17 gallons of the liquid add 4 pounds gum arabic or senegal; let these remain three or four days and a beautiful purple will be produced.

"2495. Green ink.—Boil 2 parts acetate of copper and 1 part bitartrate of potassa in 8 parts water until the solution is reduced to ½ the bulk; filter through a cloth, and when cool bottle.

"2496. Green ink.—Dissolve 108 grains bichromate of po-
254 tassa in one fluid ounce of water; add while warm ½ ounce spirit of wine; then decompose the mixture with concentrated sulphuric acid until it assumes a brown color; evaporate this liquor until its quantity is reduced to ½; dilute it with 2 ounces distilled water; filter it, add ½ ounce alcohol, followed by a few drops strong sulphuric acid; it is now allowed to rest, and after a time it assumes a beautiful green color. After the addition of a small quantity of gum arabic it is ready for use.

"2497. Violet, Magenta, and Solferino ink.—Inks of these and such other bright aniline colors may be made as follows: Mix one drachm of the proper aniline color with 1½ ounces of alcohol (see

No. 2578) in a glass or enameled iron vessel; let it stand for three hours; then add 13 ounces of distilled water and subject the whole to a gentle heat until the alcohol has evaporated—that is, until no odor of alcohol is perceptible; then add four drachms gum arabic dissolved in 3 ounces of water; mix and strain. As the aniline colors of commerce vary a great deal in quality, the amount of dilution must vary with the sample used and the shade determined by trial.

"2498. Heusler's red ink.—Take 2 ounces best Brazil wood, ½ ounce pulverized alum, ½ ounce crystals of bitartrate of potassa, and 16 ounces distilled water; boil down to ½ and strain; then dissolve it in ½ ounce gum arabic, and add 1½ drachms cochineal dissolved in 1½ ounces alcohol of specific gravity .839.

"2499. Brilliant red ink.—Brazil wood, 2 ounces; muriate of tin, ½ drachm; gum arabic, 1 drachm; boil down in 32 ounces water to one-half and strain.

"2500. Good red ink.—Ground Brazil wood, 8 ounces; vinegar, 10 pints; macerate for 4 or 5 days; boil in a tinned copper vessel to ½; then add roche alum, 8 ounces, and gum, 3 ounces; dissolve.

255 "2501. Buchner's carmine ink.—Pure carmine, 12 grains; water of am-onia, 3 ounces; dissolve; then add powdered gum, 18 grains; ½ drachm of powdered drop-lake may be substituted for the carmine where expense is an object. This makes a superb common ink.

"2502. Fine red ink.—Cochineal, in powder, 1 ounce; hot water, ½ pint; digest, and when quite cold add spirits of hartshorn, ¼ pint, or liquor of ammonia, 1 ounce; dilute with 3 or 4 ounces of water; macerate for a few days longer; then decant the clear. The color of this is very fine.

"2503. Redwood's red ink.—Guarancine and liquor of ammonia, of each 1 ounce; distilled water (cold), 1 pint; triturate together in a mortar, filter and dissolve in the solution gum arabic ½ ounce (Cooley).

"2504. To restore writing effaced with chlorine.—Expose it to the vapor of sulphuret of ammonia or dip it into a solution of the sulphuret or ferrocyanide of potassa, 5 parts; water, 85 parts; dissolve and immerse the paper in the fluid; then slightly acidulate the solution with sulphuret of hydrochloric acid. The method found to answer best has been to spread the ferrocyanide thin with a feather or a bit of stick cut to a blunt point. Though the ferrocyanide should occasion no sensible change of color, yet the moment the acid comes upon it every trace of a letter turns at once to a fine blue, which soon acquires its full intensity and is beyond comparison stronger than the color of the original trace. If, then, the corner of a bit of blotting paper be carefully and dextrously applied near the letters so as to imbibe the superfluous liquor the staining of the parchment may be in a great measure avoided, for it is this superfluous liquor which, absorbing part of the coloring matter from the letters, become- a dye to whatever it touches. Care
256 must be taken not to bring the blotting paper in contact

with the letters, because the coloring matter is soft whilst wet and may easily be rubbed off. The acid chiefly employed is the muriatic, but both the sulphuric and nitric succeed very well. They should be so far diluted as not to be liable to corrode the parchment, after which the degree of strength does not seem to be a matter of much nicety.

"2505. To make new writing look old.—Take 1 drachm saffron and infuse it into ½ pint ink and warm it over a gentle fire, and it will cause whatever is written with it to turn yellow and appear as if of many years' standing.

"2506. To write on greasy paper or parchment.—Put to a bullock's gall 1 handful of salt and one-quarter pint vinegar, stir it until it has mixed well; when the paper or parchment is greasy put one drop of the gall into the ink, and the difficulty will be instantly obviated.

"2507. To remove ink blotches from writing.—When ink blotches have been formed over writing which it is desired to decipher, we are advised to brush off the spot carefully with a weak solution of oxalic acid by means of a camel's-hair pencil. In this way layer after layer of the superincumbent ink will be removed, and finally the writing itself will, in most cases, come to view. This is especially possible where some considerable interval has elapsed between the two applications of ink. As soon as the letters are visible the brushing should be continued for a time with clean water so as to arrest the tendency of the acid solution to make a further change in the ink.

"2508. Redwood's indelible marking ink.—Dissolve 1 ounce nitrate of silver and 1½ ounces crystallized carbonate of soda
257 in separate portions of distilled water and mix the solution; collect the resulting precipitate on a filter, wash it thoroughly with distilled water, and introduce it while still moist into a wedgwood-ware mortar; add 8 scruples tartaric acid and triturate the whole until effervescence has ceased; next, add sufficient ammonia to dissolve the tartrate of silver; mix in 4 fluid drachms archil, 4 drachms white sugar, and 12 drachms finely powdered gum arabic, then add sufficient distilled water to make 6 ounces of the mixture. This ink fulfills all the conditions that a marking ink should possess; it flows freely from the pen without running or blotting; it does not require a very strong or long continued heat to develop it; when developed it is perfectly black, and it does not injure the texture of the finest fabric.

"2509. Indelible ink.—The linen is first moistened with a fluid consisting of a mixture of 2 parts carbonate of soda and crystals, 2 parts gum arabic, 8 parts water, and then dried. When quite dry it is rubbed with a glass or smooth pebble, to render it as smooth as possible so that it may be easier to write upon. The composition of the ink itself is as follows: 1⅔ parts nitrate of silver, 16 parts distilled water, 2 parts gum arabic, and ⅓ part sap green. The nitrate of silver is first dissolved in the distilled water and the gum arabic and sap green are subsequently added. It is necessary to write with a quill pen, all metallic pens except gold ones decomposing the ink.

It is a good plan to trace the letters on the linen with a pencil before writing them. This and the 4 following receipts are by Dr. Reiman, who says that they have all been thoroughly well tried and found effectual.

"2510. Fine marking ink.—Marking linen is most conveniently effected by using a small, stiff brush and a small copper plate with perforations corresponding to the letters required. This stencil plate is laid upon the linen and the ink is rubbed into the
258 cut-out spaces with a brush. The following ink is of service for marking linen with a stencil plate: 2 parts nitrate of silver, 4 parts distilled water, 2½ parts gum arabic, 3 parts carbonate of soda crystals, 5 parts liquid ammonia. The best way to prepare the ink is to first dissolve the nitrate of silver in the liquid ammonia and the gum arabic and soda in the distilled water. The two solutions are then mixed together and slightly warmed, when the whole mixture becomes brown. A few drops of a solution of magenta makes the ink somewhat more distinct. When this method is used the linen requires no previous preparation.

"2511. Analine marking ink.—Dissolve 8½ grains bichloride of copper in 30 grains distilled water, then add 10 grains common salt and 9½ grains liquid ammonia. A solution of 30 grains hydrochlorate of analine in 20 grains distilled water is then added to 20 grains of a solution of gum arabic (containing 2 parts water, 1 part gum arabic), and lastly 10 grains of glycerine; 4 parts of the analine solution thus prepared are mixed with 1 part of the copper solution. The liquid which results has a green appearance and may be at once employed for marking linen, since it invariably becomes black after a few days. A steel pen may be employed as well as a quill. If it is desirable not to wait so long for the appearance of the black color, a hot iron may be passed over the writing when the ink is dry, or the linen may be held over the flame of a spirit lamp or over a hot plate or hot water, when the black tint will readily appear. It is a good plan to put the linen when marked into a tepid solution of soap, which has the effect of bringing out a fine bluish tint. The ink must be so limpid that it is able to permeate the tissue of the linen so that the marks appear on both sides. It is advisable to mix the solution together only when the ink has to be used. It is perfectly indelible and so easy to write with that the finest devices may be drawn with it. This ink has the advantage of
259 being cheaper than the ink prepared from nitrate of silver. It has also another advantage over the latter salt, viz, that it is chemically indelible.

"2512. Purple marking ink.—A purple marking ink can be prepared by mixing one part bichloride of platinum with 16 parts of distilled water. The place where the letters have to be written must be moistened with a solution of three parts carbonate of soda, 3 parts gum arabic, and 12 parts water. The spot is then dried and made smooth. After the letters have been written with the platinum ink and become dry the linen is moistened with a solution of 1 part chloride of tin in 4 parts distilled water, when an intense and beautiful purple red color makes its appearance.

"2513. Cheap brown marking ink.—A very cheap brown marking ink may be prepared from 4 parts acetate of manganese dissolved in 12 parts water. The place on the linen where the marks have to be made must be previously moistened with the following solution: 1 part yellow prussiate of potash, ½ part gum arabic, 3 parts water. The linen having been saturated with the above solution is dried and afterwards marked with the manganese solution. On the letters becoming dry the following solution is spread over the spot with a brush: 4 parts carbonate of potash, 10 parts water. The letters then become brown and their color cannot be removed by alkalies nor by acids, with the exception of dilute hydrochloric acid.

"2514. Carbon ink.—Genuine Indian ink rubbed down with good black ink until it will flow easily from a pen. This ink resists chlorine and oxalic acid.

"2515. Indian or Chinese ink.—The pure article can only be obtained from China. A good imitation may be made with ivory black, ground to an impalpable powder, made into a paste with weak gum arabic water, perfumed with a few drops of essence
260 of musk and ½ as much essence of ambergris and then formed into cakes. (See No. 2516.)

"2516. Perpetual ink for tombstones, &c.—Equal parts of Trinidad asphaltum and oil of turpentine. Use in a melted state to fill in the letters and devices on tombstones, &c. Without actual violence it will last as long as stone.

"2517. To pulverize gold and silver leaf.—This is effected by grinding upon a porphyry slab with a muller gold or silver leaves with white honey until they are reduced to the finest possible state of division. Then wash the honey thoroughly from the powdered metal and mix with gum water. (See also No. 25.)

"2518. Liquid gold for vellum, &c.—Take gold leaf and grind it with gum water; then add a small quantity of bichloride of mercury and bottle for use.

"2519. Liquid silver for vellum, &c.—Take silver leaf and grind it with gum water or glaire of egg.

"2520. Copying ink.—The virtue of copying ink consists in its non-drying property. This property may be given to any ordinary ink by the addition of sugar. Lately, however, glycerine has been substituted for sugar, and is decidedly to be preferred. A good copying ink may be made from common violet writing ink by the addition of about 1 part glycerine to 100 parts of the ink. The addition of too large a proportion of glycerine is apt to impair the requisite drying qualities of the ink, and too little will fail to make the ink susceptible of a perfect copy. (See No. 2471.)

"2521. Ink for marking packages.—Take lampblack and
261 mix thoroughly with sufficient turpentine to make it thin enough to flow from the brush. Powdered ultramarine, instead of lampblack, makes a fine blue marking mixture for the same purpose.

"2522. Ink for marking packages.—An excellent and very cheap ink is made by mixing ¼ ounce bichromate of potassa and four ounces extract of logwood in a stone jar or demijohn with two gal-

lons of hot water. Shake well and let it stand for about 2 weeks, shaking occasionally.

"2523. Permanent ink for writing in relief on zinc.—Bichloride of platinum, dry, 1 part; gum arabic, 1 part; distilled water, 10 parts. The letters traced upon zinc with this solution turn black immediately. The black characters resist the action of weak acids, of rain, or of the elements in general, and the liquid is thus adapted for marking signs, labels, or tags which are liable to exposure. To bring out the letters in relief, immerse the zinc tag in a weak acid for a few moments. The writing is not attached while the metal is dissolved away.

"2524. Ink for zinc labels.—Take 1 drachm of verdigris, 1 drachm sal ammoniac powder, and ½ drachm lampblack, and mix them with 10 drachms water, and this will form an indelible ink for writing on zinc.

"2525. To write on silver with a black that will never go off.—Take burnt lead and pulverize it; incorporate it next with sulphur and vinegar to the consistency of a paint, and write with it on any silver plate; let it dry, then present it to the fire so as to heat the work a little, and it is completed.

"2526. Indestructible inks.—Employed for writing the
262 labels on bottles containing strong acids and alkaline solutions. They are capable of resisting the action of iodine, chlorine, alkaline lyes and acids, as well as operations of dyeing and bleaching, beside being an excellent and cheap material for marking linen, as nothing will remove them without destroying the fabric.

"2527. Hausmann's indestructible ink.—Mix 1 part genuine Trinidad asphaltum with 4 parts oil of turpentine; color with a sufficiency of plumbago for black, or vermillion for red ink.

"2528. Close's indestructible ink.—Mix 25 grains powdered cobalt and 200 grains oil of lavendar by a gentle heat; color with 3 grains lampblack and 1 grain indigo, both in fine powder. If a red color is required, omit the lampblack and ind go and add sufficient vermilion to make the mixture a good color.

"2529. Indestructible writing ink.—Shellac, 4 parts; borax, 2 parts; soft water, 36 parts; boil in a close vesssel till dissolved; then filter and take of gum arabic, 2 parts; soft water, 4 parts. Dissolve and mix the two solutions together and boil for 5 minutes as before, occasionally stirring to promote their union; when cold, add a sufficient quantity of finely-powdered indigo and lampblack to color; lastly, let it stand for 2 or 3 hours, until the coarser powder has subsided, and bottle for use. Use this fluid with a clean pen, and keep it in glass or earthen inkstands, as many substances will decompose it while in the liquid state. When dry it will resist the action of water, oil, turpentine, alcohol, diluted sulphuric acid, diluted hydrochloric acid, oxalic acid, chlorine, and the caustic alkalies and alk-line earths.

"2530. Simple carbon ink.—Dissolve 30 grains of sugar
263 in 30 grains of water, to which add a few drops of concentrated sulphuric acid. Upon heating this mixture the sugar

becomes carbonized by the acid, and when applied to the paper it leaves a coating of carbon which cannot be washed off. This stain is rendered more perfect by the decomposing action of the ink itself upon the paper, and thus resists the action of chemical agents.

"2531. Drawing ink.—A very black and indelible drawing ink may be made by dissolving shellac in a hot-water solution of borax and rubbing up in this solution a fine quality of Indian ink. After using dip the drawing pen in alcohol and wipe dry to keep it clean and bright. (See No. 2514.)

"2532. Permanent ink for use with stamps or type.—Mix equal parts black oxide of manganese and hydrate of potash, heat to redness, and rub with an equal quantity of smooth white clay into a paste, water being added for the purpose. Or: Sulphate of manganese, 2 drachms; lampblack, 1 drachm; powdered loaf sugar, 4 drachms, rubbed into paste with water. After stamping dry the linen and wash well in water.

"2533. Sympathetic or invisible inks for secret writing.—These are colorless inks which require the aid of heat or some other agency to develop the characters written with them. Their use has been rendered specially practical since the recent introduction of the postal correspondence cards in England and elsewhere. By previous arrangement between correspondents the receiver of a card only need some visible sign on the card to identify the writer or sender. This will at once suggest the means to be employed to develop the particular ink the receiver's correspondent has agreed to use.

"2534. Black sympathetic inks.—Writing with a solu-
264 tion of sugar of lead will be turned black by moistening the paper with sulphide of potassium.

"If nitrate of silver be used, the writing will become black by dipping the paper in a solution of ammonia.

"Chloride of mercury will turn black when wetted with chloride of tin.

"A weak infusion of galls is turned black by sulphate of iron (copperas).

"Reversing the above, writing with copperas turns black by moistening with infusion of galls.

"2535. Blue sympathetic inks.—Writing with copperas turns blue if wetted with a solution of prussiate of potassa.

"Nitrate of cobalt turns blue on being wetted with a weak solution of oxalic acid.

"Rice water or a solution of boiled starch turns blue in a solution of iodine in weak spirit.

"2536. Brown sympathetic ink.—A diluted solution of nitrate of silver turns brown by exposure to the sunlight.

"2537. Yellow sympathetic ink.—Chloride of antimony, used as the ink, will become yellow by moistening with a decoction of galls.

"2538. Green sympathetic ink.—Arseniate of copper washed over with nitrate of copper turns a beautiful green.

"2539. Purple sympathetic ink.—Purple is produced by using chloride of gold and soaking in chloride of tin.

265 "2540. Sympathetic inks developed by heat.—There are a number of colorless substances that may be used as inks, which are developed by the application of heat only.

"Sulphate of copper and sal ammoniac, mixed in equal parts, will become yellow if exposed to the fire.

"Onion juice has the same property as the above mixture.

"Lemon juice, a very weak solution of ether, aquafortis, oil of vitriol, common salt, or saltpetre will turn yellow or brown on exposure to the fire.

"A weak solution of chloride of cobalt and chloride of nickel is turned a beautiful green by heat.

"A solution of chloride or nitro-muriate of cobalt turns green when heated and disappears again on cooling.

"A dilute solution of chloride of copper become a fine yellow at a moderate heat and disappears on cooling.

"A solution of acetate of cobalt, with a little nitrate added to it, turns rose colored by heat and disappears again when cold.

"These last, which disappear again on cooling, are the best sympathetic inks for purposes of correspondence, as the others are more or less indelible when once developed.

"2541. Hoe's composition for printing-ink rollers.—This consists of glue and molasses, the proportions varying from 8 pounds of glue in summer to 4 pounds in winter for each gallon of molasses.

266 The glue should be placed for ½ an hour in a bucket covered with water, then pour the water off and allow the glue to soften. Put it into a kettle and heat it until thoroughly melted; if too thick a little water may be added. Lastly, the molasses is stirred in and well mixed with the glue. When properly prepared an hour's boiling will be sufficient, as too much boiling is apt to candy the molasses. Pour into a clean mould well oiled with a swab.

"2542. To clean ink rollers.—Rollers should not be washed immediately after use, as they will become dry and skinny, but they may be washed ½ hour before using again. In cleaning a new roller a little oil rubbed over it will loosen the ink, and it should be scraped clean with the back of a knife. It should be cleaned this way for about a week, when lye may be used. New rollers are often spoiled by washing too soon with lye.

"2543. Black printing ink.—Boil 1½ gallons old clear linseed oil to the consistence of a thick varnish; whilst hot add to it, during constant stirring, first, 6 pounds powdered resin and next 1¾ pounds dry brown-soap shavings; then mix in it 2½ ounces indigo blue, 2½ ounces Paris blue, and 5 pounds best lampblack. After standing for a week it should be ground.

"2544. Black or colored printing ink.—Balsam copaiba, 9 ounces; lampblack, 3 ounces; Paris blue, 1¼ ounces; Indian red, ¾ ounce; dry resin soap, 3 ounces. These will produce a superior black ink. By employing white soap instead of yellow and a sufficiency of some

coloring pigment instead of the black, blue, and red mixture a good colored ink will be obtained.

"2545. New ink for printers.—A new ink for printers has been invented by Professor Artus and Mr. Fleckstein, a master
267 printer at Lichtenhain, which ink is said to be a complete success. The composition of it is as follows: Venetian turpentine, 4½ ounces; fluid soap, 5 ounces; rectified oleine, 2 ounces; burnt soot, 3 ounces; Paris blue (ferrocyanic acid), ½ ounce; oxalic acid, ¼ ounce; distilled water, ½ ounce. The mixing process of this new, beautiful, and cheap ink is described as follows: Gradually warm the turpentine and the oleine together; put the soap on a marble plate and gradually add, continually rubbing the mixture of turpentine and oleine; when well mixed add the burnt soot, which must first be well powdered and sifted; then add the Paris blue, dissolved in the oxalic acid, continually rubbing the composition on the stone, the Paris blue and the oxalic acid having been mixed before with water in the above-given proportions. A solution of soda in water is sufficient to thoroughly cleanse the type.

"2546. Indelible printing ink.—Mix 1 pound varnish (such as is used for ordinary printing ink), 1 pound black sulphu-et of mercury, 1 ounce nitrate of silver, 1 ounce sulphate of iron, 2 tablespoonfuls lampblack. Thoroughly grind together, adding enough turpentine to reduce to the requisite consistency.

"2547. Lithographic ink.—Grind together 8 parts mastich, in tears, and 12 parts shellac; dissolve carefully by heat in 1 part Venice turpentine. After the mixture is taken from the fire mix in 16 parts wax and six parts tallow; then add, by stirring 6 parts hard tallow soap in shavings, and finally incorporate in the mass 4 parts lampblack. Heat and stir until thoroughly mixed; let it cool a little and pour it out on tables, and when cold cut it into square rods.

"2548. Lithographic transfer ink.—Melt together 8 parts white wax and 2 parts white soap and, before they become hot enough to take fire, stir in, by degrees, sufficient lampblack to make the mixture black; then allow the whole to burn for 30 seconds;
268 when the flame is extinguished add, a little at a time, two parts shellac, stirring it in constantly; put the vessel on the fire again until the mass is kindled or nearly so. Put out the flame and allow it to cool a little and then run it into the molds. Ink thus made will make as fine or coarse lines as are desired, and its traces will remain unchanged for years before transferred. When suet enters into the composition of lithographic crayons it does not keep long and requires immediate transferring to the stone.

"2549. Lithographic ink.—M. Lasteyrie states that after having tried a great many combinations he gives the preference to the following: Dry tallow soap, mastich in tears, and common soda in fine powder, of each 30 parts; shellac, 150 parts; lampblack, 12 parts; mix as last. Used for writing on lithographic stone.

"2550. To test the quality of lithographic ink.—Lithographic ink of good quality ought to be susceptible of forming an emulsion so attenuated that it may appear to be dissolved when rubbed upon

a hard body in distilled or river water. It should be flowing in the pen, not spreading on the stone; capable of forming delicate traces and very black, to show its delineation. The most essential quality of the ink is to sink well into the stone so as to reproduce the most delicate outlines of the drawing and to afford a great many impressions. It must, therefore, be able to resist the acid with which the stone is moistened in the preparation without letting any of its greasy matter escape.

"2551. Durable autho*g*raphic ink.—White wax, 8 ounces, and white soap, 2 to 3 ounces; melt. When well combined add lampblack, one ounce; mix well and heat it strongly; then add shellac, 2 ounces; again heat it strongly; stir well together; cool a little and pour it out. With this ink lines may be drawn of the finest
269 to the fullest class without danger of its spreading, and the copy may be kept for years before being transferred. This ink is employed for writing on lithographic paper, and is prepared for use by rubbing down with a little water in a saucer in the same way as common water-color cakes of Indian ink. In winter this should be done near a fire, or the saucer should be placed over a basin containing a little warm water. It may then be used with either a steel pen or a camel's-hair pencil."

(Complainants' counsel waives proof of publication and notes an objection to the immateriality of the article.)

Defendants rest.

270 Testimony in rebuttal on part of complainants, taken pursuant to 67th rule, Supreme Court, as amended.

Mr. Hudson reads testimony of HENRY MORTON, previously sworn and examined:

Q. 1. Have you examined carefully and do you understand the several patents and extracts from printed publications that have been marked in evidence by the defendants? If yea, please analyze such of them as seem to you to have any bearing upon the claims of the complainants' patent and state fully what you find to be the real scope and effect of them, identifying each as considered by the marking you find upon it made by the examiner, and whether you find the invention that is described and claimed in the complainants' patent set forth or suggested in either of them, giving your reasons for any opinions you may express.

271 A. I have examined all the patents and publications referred to and find that most of them are quite irrelevant to the subject of the patent in suit, but I will refer to each individually and indicate what it contains and what reference or lack of reference there may be therein to the subject now under consideration.

Beginning with the English patents introduced as exhibits and taking them up in their order of date, I find the first to be "Defendants' Exhibit Mikovinij English Patent." This is dated "A. D. 1777." This patent appears to me entirely irrelevant, as it ap-

pears to be a patent for a composition of tartar, saltpetre, and pearl-ash or the like substances to be used in the "manufacturing, improving, dressing, and bleaching hemp, flax, and other vegetable substances."

The next is that marked "Defendants' Exhibit Frith English Patent." Its date is "A. D. 1798." This also I find to be entirely irrelevant, since it is, as its title states, for a "chemical method of dy-ing different permanent colors upon cotton, linen, woolen, and silk;" and this method appears to consist in the preparation of dye baths by the treatment of liquid extract from galls, oak bark, and other barks and woods with aquafortis or nitric acid previously treated with tin, silver, iron, or quicksilver, and in some cases with an addition of sulphate of iron or of manganese. This patent, being for the production of a dye bath in which to dye or permanently color woven fabrics, has manifestly not the remotest relation to the patent in suit, which is for an article known as carbon or semi-carbon paper, consisting of a sheet of paper or like vehicle coated on one or both surfaces with a certain oleaginous pigment in no respect permanently attached, but, on the contrary, capable of coming off continuously from time to time and for a great number of times during the entire useful life of the said carbon or semi-carbon paper.

The next is "Defendants' Exhibit Wedgwood English
272 Patent," dated "A. D. 1806." This patent is undoubtedly relevant to the subject in hand, although it neither contains the invention of the patent in suit or in any strict sense suggests it. According to its own title this patent is for "an apparatus for producing duplicates of writings." It first describes what it calls "a prepared paper." This is manifestly a thin paper, made transparent by smearing it with some sort of fixed oil. It then describes the preparation of a transfer paper which is to consist of leaves of thin paper or other thin substance, over which has been spread an ink made of carbon "or any other coloring substance," the same having been thoroughly ground "in any kind of oil." After such treatment these leaves of paper or the like are to remain for a time between sheets of absorbent or blotting paper. It is also stated "some coloring substances may likewise be used without any medium or vehicle." It is manifest that this patent describes in general terms the preparation of a transfer paper having some of the general properties of the carbon or semi-carbon paper of the patent in suit, but it does not either disclose or suggest the invention of that patent by reason of its indefiniteness. It simply tells us that any coloring matter ground with any kind of oil may be employed to produce such transfer paper, and does not state or suggest that by the use of certain precipitates of vegetable coloring matters combined with certain oleaginous substances transfer papers having special and valuable characteristics will be produced; and this last is exactly what the patent of complainants does set forth, and it is just such an improved transfer paper that said patent describes and claims. It is, of course, as I understand, admitted on all sides that transfer papers made with carbon and oleaginous substances were old at the date

of complainants' patent; also that similar papers made with other pigments than carbon were also old at this date, but that no one prior to this date had discovered and pointed out that by the
273 use of precipitates of vegetable coloring matters such as they have specifically indicated in combination with such oleaginous substances as they likewise point out an improved transfer paper could be produced. Such new and improved transfer paper which is the subject of their invention, as embodied in the patent in suit, is manifestly neither described nor suggested in the Wedgood patent.

The next is "Defendants' Exhibit Kurtz English Patent," bearing date "1847." This is another of what I should consider the irrelevant references, being, as its title states, "a new manufacture of a certain coloring matter to be used in the dy-ing or in the printing of woolen, cotton, silk, and other fabrics." This new coloring matter is described, in the first place, as being a liquid, obtained by the action of nitric or nitrous acid on aloes or extract of logwood, the acid so acting upon vegetable matter as to cause a disengagement of gas and therefore substantially to change the material. Any remaining undecomposed acid is to be neutralized with soda or potash. If, further, it should be desirable to have the coloring matter in a dry state, it is to be incorporated with a large amount (about its own weight) of china clay and then dried by the application of heat. In the use of this coloring matter it is directed that "the material to be dyed is introduced into the bath," or where the process is to be one of printing it is applied "by dissolving or diffusing the mixture in a sufficient quantity of water," and after printing the cloth must be subjected to the operation of steaming "to fix the color on the cloth." It is therefore manifest that in this patent we have described the preparation of a dyestuff to be used in a liquid form, so as to impart a fixed or permanent color to woven fabrics, which manifestly in nowise suggests the preparation of a transfer paper, whose essential characteristic is that the color applied to it shall not be fixed or permanent.

274 The next is "Defendants' Exhibit Swan English Patent," bearing date "A. D. 1856." This again appears to me to be an entirely irrelevant reference, since it describes a fluid ink "applicable to the purposes of writing, staining, or dyeing." The fluidity and indelibility of the product are specially pointed out. Straining or otherwise purifying are likewise mentioned, and it is also stated that when for preservation the substance has been reduced to a solid form it is when required for use "reduced to a liquid form by dilution with any suitable proportion of water." When desired to convert this ink into a copying fluid the usual saccharine or other thickening ingredients are to be added. This refers to the well-known employment of what are known as copying inks, where copies from manuscript are obtained by the application of moist sheets of paper in a press.

The next is "Defendants' Exhibit Underwood and Burt English Patent," dated "A. D. 1856." This also appears to me quite irrelevant, because it describes the manufacture of what are known as

copying inks—that is, inks which being used in a fluid state for writing or printing will allow copies to be taken from the manuscript or impression by the use of moist paper in a press. As will easily be understood, the vehicle or fluid constituents in such inks could not possibly be an oleaginous substance, but must be one capable of dissolving in water, or, in other words, be the precise opposite of an oleaginous matter. It is hardly necessary to say, therefore, that this patent for fluid copying inks neither contains nor suggests in the remotest way complainants' invention of a transfer paper.

The next is "Defendants' Exhibit Roberts and Dale English Patent," dated "A. D. 1857." This again seems to me to be an irrelevant reference, since it describes a method of obtaining pigments from dye-woods and the application of a pigment to
275 wall paper. The pigments are obtained by boiling barwood or like dye-wood in water and then adding a salt of tin decomposible by solution, so that the precipitate so formed may take with it the color extracted from the wood. This precipitate is then used as a pigment for general purposes. It is suggested that other metallic salts may be similarly employed and that the pigment produced may be mixed with "chalk, china clay, sulphate of barytes, etc." Manifestly there is nothing here describing or suggesting the invention of complainants' patent.

The next is "Defendants' Exhibit Dale and Caro English Patents," dated "A. D. 1860." This likewise seems to be an irrelevant reference because it is an improvement in dyeing cotton, yarns, or threads and fabrics, which consists in preparing two dye-baths, one containing the coloring principles of various woods and barks in solution together with solutions of metallic salts, and the other consisting of a solution of free alkali or the like for the purpose of developing and precipitating the color in the substance of the cloth. This is in substance the old and familiar process of dyeing by first soaking the fabric in a bath which contains a dissolved coloring matter and then passing it through a second bath containing likewise in solution a substance or substances able to combine with and precipitate within the fibres of the cloth the coloring matters which they had imbibed in the first bath. It is hardly necessary to say that this has to do with the production of dyed fabrics whose colors will be as permanent as possible. It has not the remotest bearing upon the invention of the patent in suit.

The next is "Defendants' Exhibit Johnson English Patent," dated "A. D. 1860." This likewise is, I think, totally irrelevant, being a patent for the production of a peculiar coloring matter which the inventor calls "panphiteic acid" and which he supposes to be produced by treating almost any vegetable substance
276 with nitric acid. It has manifestly nothing to do with the subject here considered.

The next is "Defendants' Exhibit Mayall English Patent," dated "A. D. 1862." This is again utterly irrelevant, being for a process of dyeing mixed or plain fabrics by successive immersions in three

vats or less. This is entirely without bearing upon the present question.

The next is "Defendants' Exhibit Schultz English Patent," bearing date "A. D. 1861," which is likewise entirely irrelevant, being for the employment of a decoction of logwood combined with caustic soda for producing different shades of black, chocolate, olive, and other colors upon cotton, wool, silk, and other fabrics.

The next is "Defendants' Exhibit Greene English Patent," dated "A. D. 1863." This patent is for the production of black coloring matters or pigments by precipitating galls, logwood, and various like materials with the mordants commonly employed in dyeing to produce black with such substances. These precipitates are generally to be combined with china clay or the like. The pigments so produced, it is then suggested, may be used as a substitute for lampblack or other familiar black pigments. This patent is so far relevant that it describes in general terms the production of black pigments, some of which perhaps might be used in carrying out the invention of complainants' patent, but it contains no hint or suggestion of such patent and in nowise discriminates between such blacks as would be entirely unfit for this purpose and those, if any, which might be so applied.

The next is "Defendants' Exhibit Brooman English Patent," dated "A. D. 1863." This is an irrelevant reference, because it is for improvements in dyeing mixed animal and vegetable fibers, and consists in the preparation of a dye-bath in which both sorts of fibres may be dyed at once or in the use of two baths for the same purpose.

277 The next is "Defendants' Exhibit Henry English Patent," dated "A. D. 1864." This is an obviously irrelevant question, because it describes improvements in dyeing and tanning and in preparing for dyeing and printing, which consist in the preparation of certain dye-baths, or other baths, for bleaching or other preliminary treatment, and for methods of working the goods to be dyed in such baths. In this and in several of the other irrelevant patents above noticed logwood and other woods, and also various metallic salts, are referred to as being used in the preparation of dye-baths; but this, of course, gives them no relevancy to the patent in suit, because it is not claimed that the invention there set forth includes the use generally of logwood or other woods in combination with metallic salts in the industry of dyeing, in the manufacture of pigments or of writing or of printing inks, but is confined, as has been before stated, to the combination of certain precipitates of vegetable coloring matters combined with certain oleaginous bodies and applied to paper or like vehicle so as to produce such a product as that generally known as carbon or semi-carbon paper.

Considering next the United States letters patent put in evidence by defendants, the first of these referred to by them is "Defendants' Exhibit Cowan Patent," dated May 4, 1869. This is a patent for the preparation of copying paper and therefore at least relevant to the matter in hand. Invention is set forth in this, however, essentially different from that contained in complainants' patent in suit.

In the Cowan patent we are directed to make a mixture of boiled linseed oil, spirits of turpentine, and copal varnish. With this mixture, which is of a highly drying nature and nowise oleaginous, the paper is to be smeared and allowed to soak and dry for about half an hour. To the paper so prepared is then to be applied a mixture consisting of various pigments with raw linseed oil, olive oil, turpentine, and beeswax. Now, it is manifest that in this patent there is no reference to or suggestion of the
278 use of a precipitate or vegetable coloring matter such as is indicated in complainants' patent, combined with such oleaginous substances as are there likewise indicated, and with paper or a like vehicle. On the contrary, we find that the pigments indicated are all of a substantially mineral nature, the only exception being that in one out of six recipes a portion of the color is carmine, which has an animal or insect origin. In the next place, the fluid with which these coloring matters are ground in each case contains turpentine, and the mixture, being spread upon paper previously saturated with a highly siccative or drying mixture of boiled oil and varnish, will likewise be rendered substantially resinous or drying and utterly unlike the oleaginous materials referred to in the patent in suit. I therefore find that this Cowan patent neither states nor suggests the invention of the patent in suit, but, on the contrary, suggests an invention in a different direction, and is adapted to lead any one following it away from the line pursued in the patent in suit.

I next find "Defendants' Exhibit Holt Patent." This bears date April 25th, 1865, and is for a composition with which to saturate the ribbons used in hand stamps. The composition here described is stated to be a solution of aniline colors in glycerine or some fatty material which will dissolve them, and with this solution the ribbon is to be saturated. It is hardly necessary to say that this invention is entirely distinct from and in nowise suggestive of that of complainants' patent, with which it has absolutely no element in common.

Again I find "Defendants' Exhibit Hendricks Patent." This is dated April 12th, 1881, and is for a safety lithographic ink—that is, a printer's ink—so constituted as not to be removable by acids and like materials, such as are usually employed to efface writing, but, on the contrary, to suffer such change in color as will betray the attempt to employ acids or the like for the above-mentioned
279 purposes. There is nothing in this invention, in the remotest way even, suggesting that of patent in suit. The ink of this Hendricks patent is made up with photographers' varnish, which is in no proper sense an oleaginous substance, and certainly totally unlike the oleaginous substances alluded to in complainants' patent. The pigments employed with it are substantially of a mineral character, and the entire mixture would be utterly unfit for use in the preparation of a transfer paper of any sort.

In the next place I find "Defendants' Exhibit Edgerton Patent," dated December the 11th, 1877. This patent not only does not contain or suggest the invention of the patent in suit, but describes an

invention which is diametrically opposite to that said patent; in other words, it is for an indelible unerasable ink for cancelling postage stamps, whose characteristics are that when once applied to a surface of paper or the like it shall adhere thereto so firmly that before it can be removed the material of the paper would have to be reduced to a pulp. To cite such a patent as anticipating one for the production of transfer paper is, on the face of it, almost absurd, and the absurdity does not diminish when we read that the ink in question is composed of iodine, indigo, red and blue aniline, iron rust, brick dust, muriatic acid, and alcohol. When we notice that no oleaginous substance whatever is mentioned and that there is, of course, no suggestion that this indelible and unerasable mixture should be applied to paper or like surface for the production of a transfer paper.

Turning next to the printed publications which have been cited by defendants, I find, in the first place, an article on logwood inks in the Scientific American of August the 12th, 1876. As a reference to the patent in suit this article appears to me entirely irrelevant, because it describes only fluid or writing inks made from logwood, and neither states nor suggests anything whatever in the line of complainants' patent in suit. I have myself used such
280 logwood inks as are described in this article for more than thirty years, and have occasionally been troubled with the formation of a precipitate in such inks in an irregular and unexpected manner, but neither I nor the writer of this article even found this fact suggestive of the use of a logwood precipitate for any purpose, and still less for the preparation of such a precipitate as complainants' patent indicates, and its use in connection with certain oleaginous substances in the production of a transfer paper.

In the next place I find a reference to the entire article on dyeing in Ure's Dictionary of Arts, Manufactures, and Mines. This reference is, in my opinion, as irrelevant as it is voluminous. The only point in this immense article which comes even within telescopic range of the subject in hand is its statements to the effect that logwood and other like vegetable colors combine in the processes of dyeing in the fibres of open fabrics with mineral salts and other mordants, so as to produce fixed colors. It has, however, never been claimed or suggested that the invention of the patent in suit covered the use of logwood in any of the processes of dyeing, printing-ink making, or the like or of any other vegetable color, and therefore all such matter as that of this extract is, as I have said, utterly irrelevant.

Precisely the same may be said in regard to the next reference, namely that to the article entitled "Brown dye," in the same book, and likewise in reference to the article on dyeing in the supplement to Ure's Dictionary.

The next reference is that to Knight's American Mechanical Dictionary, article eight. I find in this article nothing either describing or suggesting anything constituting even a part of the invention contained in the patent in suit, but simply a mass of irrelevant matter, being the description of all sorts of inks, which would be entirely

unfit for use even as parts of the combination set forth in the complainants' patent.

281 The same criticism applies to the reference from Knight's New Mechanical Dictionary, which here likewise includes the entire article on ink.

And the same statement likewise applies to the reference to Dick's Encyclopedia of Practical Receipts and Processes, article eight.

In conclusion, I would say that having in mind the entire mass of defendants' exhibits, patents, and publications I find therein nothing whatever which anticipates, contains, or suggests the invention of complainants' patent in suit, but only find some things which illustrate the gradual development of the art of producing transfer paper as it advanced towards the point reached in the invention set forth in complainants' patent in suit.

Q. 2. Have you read the testimony of Alexander B. Fernald and Stephen T. Smith and do you understand it?

A. I have read this testimony and believe that I understand it.

Q. 3. Do you find in this testimony anything which shows a knowledge on their part of the subject-matter of complainants' patent in suit prior to the date of said patent? Please state fully your reasons for any opinion you may express.

A. I find nothing in this testimony indicating a prior knowledge on the part of these witnesses of the invention set forth in complainants' patent. As I have already pointed out, the invention set forth in complainants' patent is the combination of a certain precipitate of vegetable coloring matter with certain oleaginous substances and a sheet of paper or like fabric for the production of a transfer

282 paper such as is known by the name of carbon paper or semi-carbon paper. This being, as I understand, the invention of the patent, I do not find it anywhere described in the testimony of the witnesses referred to, because such witnesses never appeared to have used in any of the experiments or applications to which they refer such a combination. The nearest approach that they make to such a combination is where they describe the grinding together of certain colors, chiefly what are known among color dealers as lakes, with oleaginous substances in the preparation of transfer papers. I am familiar with such colors and have been so for many years past, and am confident that none of them are the equivalent of the precipitate of vegetable coloring matter described in complainants' patent. All such commercial pigments and lakes are substantially mineral in their composition, being in fact either entirely mineral substances, as, for example, in the case of Prussian blue, cobalt blue, chrome yellow or chrome orange, Indian red, umber, and the like, or if lakes made from vegetable colors, then consisting chiefly of the mineral substance alumina, which is simply stained or colored by the coloring matter in and through whose solution it is precipitated. The formation of lakes does not consist in the precipitation of an organic coloring matter by the use of alkalies, mineral salts, etc., but, on the contrary, does consist in the formation of a precipitate of alumina (the main constituent of clay) or like mineral substance in a solution of coloring matter under such conditions that

said coloring matter stains or colors the alumina as the latter is precipitated. The result of this is that such lakes consist mainly of such mineral matter, and are thereby rendered entirely unfit for producing such a transfer paper as that which is the subject of complainants' patent. Experiments such as are indicated by the testimony of the witnesses referred to, made with lakes and other colors, such as would be purchased from Devoe & Company,
283 Reynolds & Company, or other like dealers, would undoubtedly have produced transfer papers of very inferior quality, if not quite useless, and would in nowise have shown the good results or revealed the essential features of the invention set forth in complainants' patent. The precipitate of dye matter set forth and described in complainants' patent is essentially a precipitate of the pure coloring matter with very little mineral matter of any sort, and it is to this characteristic that it owes its efficiency and value as a constituent of the combination set forth in this patent. It is therefore manifest that the valuable properties developed in this invention could not have been secured with any of the materials used by the witnesses referred to, and therefore it follows that this invention was not and could not have been contained in or revealed by any of their experiments.

Q. 4. Have you read the testimony of Mr. Frederick W. Underwood as given in this case, and do you understand the same? Do you find in this testimony anything showing that prior to the completion of the invention set forth in this patent that Mr. Underwood had in any of his earlier experiments produced any transfer papers embodying the invention of this patent? Please state fully your reasons for any opinions you may express.

A. I do not find that in any of the experiments made by Mr. Underwood prior to those which involved this invention and which were made about the time of his application for this patent Mr. Underwood produced any transfer papers which contained or embodied the invention of the patent in suit. My reasons for this opinion are as follows: It appears clearly from Mr. Underwood's testimony that in all his prior experiments he used deliquescent salts, which were admixed as such with the color and oleaginous material employed in preparing the transfer papers. The employment of such deliquescent salts would substantially modify the material and render it quite unfit to perform the
284 useful functions belonging to the invention contained in the patent in suit. These deliquescent salts would attract moisture from the air, which would tend to separate the coloring matter from the oleaginous material with which it had been mixed and with which it ought to remain in combination. The moisture so absorbed would also tend to dissolve the coloring matter and make it come off from the transfer paper at times when it ought not to do so; on the other hand, when the atmosphere became very dry, even highly deliquescent salts would yield a large part of their moisture to the air or dry up and would thus fail to impart to the coloring matters the softness and other properties which they were intended to confer. For these reasons the use of delequiscent salts would

prevent the development of the useful properties found in this invention, and their employment fully explains and accounts for the unsatisfactory results obtained by Mr. Underwood in his prior experiments.

HENRY MORTON.

Cross-examination waived.

Sworn to before me—

JOHN A. SHIELDS,
Special Examiner.

285 U. S. Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS. } In Equity.

On the pleadings and all the proceedings, evidence, exhibits, and the decision herein made on the 13th day of February, 1889, and on the annexed affidavit of the complainants and of their solicitor, let the defendants show cause before me at the United States court-house in the city of New York, on the 1st day of March, 1889, at 10.30 o'clock in the forenoon, or as soon thereafter as counsel can be heard, why the relief prayed in said affidavits should not be granted; and until the hearing and determination of such motion let the defendants and their solicitors refrain from any further proceedings under the decision hereinabove mentioned.

Dated at chambers, February 15th, 1889.

E. HENRY LACOMBE.

U. S. Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS. } In Equity.

EASTERN DISTRICT OF NEW YORK, *ss:*

286 John T. Underwood and Frederick W. Underwood, being severally and duly sworn, both depose and say that they are the patentees to whom letters patent 348,072 were granted by the United States, and that the title thereto and all rights and interests thereby secured have ever since the grant thereof remained and yet remain vested in them.

That they have read over the deposition made by their solicitor of even date herewith and respectfully join in the prayers thereof.

JOHN T. UNDERWOOD.
FRED'K W. UNDERWOOD.

Subscribed and sworn to before me this 14th day of February, 1889.

JOS. S. MICHAEL,
[L. S.] *Notary Public, New York County.*

U. S. Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS. } In Equity.

EASTERN DISTRICT OF NEW YORK, *ss:*

James A. Hudson, being duly sworn, says: I am the solicitor for the complainants in the above-entitled suit; therein a bill was filed against the defendants for alleged in- for letters patent No. 348,073, granted to the complainants on the 24th of August, 1876, for an improved reproducing surface for typewriting and manifolding.

An answer was therein filed by the defendants denying infringement, denying the validity of the patent, &c. Evidence was taken on the part of the complainants and on the part of the defendants at great length, and many exhibits were introduced and much time was spent and expense incurred in preparing for the trial of
287 the issues.

The cause came on to be heard on final hearing on bill, answer, and proofs before the court, Hon. E. Henry Lacombe, circuit judge, and was argued on the part *pf* the complainants and of the defendants, and upon the argument a preliminary question was raised by the defendants to the effect that another patent that had been granted to the same complainants on the same day with the patent in suit, for the composition of matter that forms one of the component parts of the manufacture patented in the patent in suit, should be considered as a defense available to these defendants. The answer did not raise any such question.

The cause was also argued fully upon the merits and submitted.

After due deliberation a decision bearing date the 13th day of February, 1889, was reached and handed down by the court.

As that decision is understood by deponent, the holding is that the patent upon the composition of matter (the one not sued on) must for all the purpose of this suit be considered as prior public knowledge available to the defendants as a defense and as defining or aiding in defining the prior state of the art by which the question of invention claimed in the patent in suit must be determined.

Further than this, as deponent understands that decision, the case has not been decided upon the merits.

In view of the fact that the question presented and which controls the decision was novel, and that presumptively on the record the title to the patent for the composition of matter is yet in the complainants, and that so much evidence necessary to a consideration of the real question between the parties upon the merits has been taken at great expense, and that it is desirable to the
288 trade as well as to the parties in interest that the case should be determined upon the merits of the invention of the complainants that was divided into these two patents, deponent respectfully prays the court on behalf of the complainants that they may be allowed to amend their bill of complaint herein by the insertion of apt words, so that the same shall declare upon the other of said

letters patent also, to wit, letters patent No. 348,072, and also charge infringement by the defendant- of the invention therein set forth, and that the defendants may plead, demur, or make answer thereto, and that the case may be reopened for the purpose of letting in such further evidence as may be necessary that equity may be done between the parties.

Deponent also prays on behalf of the complainants that all proceedings on said decision be stayed until the hearing and determination of this motion, and thereafter if the motion shall prevail until a decision shall be reached on final hearing after such amendment and further evidence; all this on such terms as to the court shall seem just and equitable to the end that justice may be speedily done in the premises without multiplicity of proceedings.

JAMES A. HUDSON.

Subscribed and sworn to before me this 14th day of February, 1889.

J. S. MICHAEL,
[L. S.] *Notary Public, New York County.*

U. S. Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS. } In Equity.

289 *Extract from Letter of Mr. Briesen to Judge Lacombe, February 8th, 1889.*

"* * * But in this connection I beg to urge upon your honor to give us in your decision the benefit of your judgment on the other defenses presented, as by so doing the unnecessary expense and vexation of future litigation may be avoided. I am satisfied that the complainants as well as the defendants are anxious to avoid unnecessary future litigation.

"A copy of this letter has been this day forwarded to Mr. Hudson, the complainants' solicitor.

"Very respectfully, A. V. BRIESEN."

Endorsed. Affidavits and order to show cause. Filed March 6th, 1889.

At a stated term of the circuit court of the United States of America for the eastern district of New York, held at the U. S. court-house, in the city of Brooklyn, on the 20th day of March, 1889.

Present: Hon. E. Henry Lacombe, circuit judge.

JOHN T. UNDERWOOD *et al.*
vs.
HENRY GERBER *et al.* } In Equity.

290 This cause coming on to be heard after final hearing upon the complainants' motion for leave to amend the bill of com-

plaint and to take further proofs, and James A. Hudson, Esq., having been heard in support of the motion and Arthur V. Briesen, Esq., in opposition, now, upon consideration thereof, it is—

Ordered that upon the payment of the defendants' costs on the final hearing heretofore had in this cause, which are to be taxed by the clerk of this court, the complainants shall have leave to amend their bill of complaint by the insertion of apt words whereby their ownership and the infringement by defendants of letters patent No. 348,072 shall be alleged; that upon service of the bill of complaint so amended the defendants shall answer, plead, or demur as they may be advised; that after replication shall be filed by the complainants proofs shall be taken strictly limited to the questions of ownership, infringement, and validity of said patent No. 348,072, said proofs to be taken by both parties before John A. Shields, Esq., as master, and that the cause shall stand for final hearing on all the issues after the proofs shall have been introduced.

It is further ordered that the complainants shall pay all the expenses of taking testimony in this cause hereafter (that taken by complainants and that taken by defendants), such expenses to include witnesses' fees, mileages, examiner's or master's fees, and printing.

It is further ordered that if the complainants shall fail to pay the costs that may be taxed herein in favor of the defendants on the hearing heretofore had within ten days after the service of notice of perfected taxation or fail to file their amended complaint within ten days after the payment of the costs their bill of complaint be dismissed.

It is further ordered that the leave to amend the
291, 292, 293 bill of complaint is conditioned upon the payment of the taxed costs and upon the payment of the subsequent expenses of taking testimony in the cause.

It is further ordered that John A. Shields, Esq., United States commissioner, be, and he is hereby, appointed master *pro hac vice* to take and report the testimony hereafter to be taken in this cause within the limitations of this order.

E. HENRY LACOMBE.

Endorsed: Order allowing amendment to bill. Filed March 20th, 1889.

Circuit Court of the United States, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS. } In Equity.

This cause came on to be heard on pleadings and proofs and due consideration had. Now, on motion of Briesen, Steele & Knauth, defendants' solicitors, it is—

Ordered, adjudged, and decreed that the complainants' bill of complaint herein be, and the same hereby is, dismissed with costs,

taxed at the sum of $542.31 to defendants, and that defendants have execution for the same.

Dated April 26, 1889.

E. HENRY LACOMBE.

Endorsed: Final decree. Filed and entered April 26th, 1889.

294 COMPL'TS' EXHIBIT PRINTED CIRCULAR. Feb. 23, 1888. J. A. S., Spec. Ex'r.

UNDERWOOD
vs.
GERBER.

Compl'ts' Exhibit Printed Circular. Feb. 23, 1888. J. A. S., spec. ex'r.

Gerber's typewriter carbon paper for manifolding purposes is the best in the market. It can be used oftener and is cheaper in price than any other. It neither creases, smuts, nor sticks to the paper. Any sheet not found satisfactory will be cheerfully exchanged.

Cash prices as follows:

Semi-carbon:

Size.	Per dozen sheets. A 1.	A 2.
8 x 10	$0.40	$0.30
8 x 11	.40	.35
8 x 12	.40	.40
8 x 13	.50	.45
8 x 14	.60	.50

$3.00 per hundred sheets.

Full carbon at correspondingly low prices. Special rates made to large consumers. Paper prepared any color or size required. Orders by mail, telegraph, or telephone promptly filled and forwarded without extra charge.

Send for sample sheet. Free by mail to any address.

Henry Gerber, sole manufacturer.

Office, 78 Nassau St., New York city; factory, Brooklyn, N. Y.

295 EXHIBIT COMPL'TS' PATENT. Febr'y 23, 1888. J. A. S., Spec. Ex'r.

UNITED STATES PATENT OFFICE.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD, of Brooklyn, New York.

Reproducing Surface for Typewriting and Manifolding.

Specification forming part of Letters Patent No. 348,073, dated August 24, 1886. Application filed March 22, 1886. Serial No. 196,200. (Specimens.)

To all whom it may concern:

Be it known that we, John T. Underwood and Frederick W. Underwood, citizens of the United States, both residing at Brooklyn, in the county of Kings and State of New York, have invented an improved reproducing surface for typewriting and manifolding, of which the following is a specification:

Our invention relates to an improved reproducing-surface adapted to be employed for obtaining copies of type writing or other printed or written impressions by means of a type-writer or other printing device, or by the employment of a stylus or other writing means.

Our improved transfer-surface is spread upon a sheet or vehicle, and when so applied is adapted to be employed in place of the articles of trade commonly known and designated as "carbon paper" or "semi-carbon paper," which are employed by type-writers and others to produce copies of impressions either obtained by a machine or by a stylus or other writing means.

In carrying out our invention we employ in the manufacture of our improved transfer-surface dye-wood solutions or their active principles, which we filter and precipitate with alkalies and mineral salts, or with alkalies, acids, and mineral salts, or with acids or alkalies alone. After the solution has been filtered the precipitate is removed from the filtering device and dried. The precipitate is then mixed with lard-oil and wax or their equivalents, and the mixture is then ground together in a warm state.

The dye solutions we prefer to employ are obtained from logwood or hæmatoxylin, the active principle of logwood, Brazil wood, sapan wood, peach-wood, madder, or its active principle—alizarine.

The proportions we find to answer well in producing our improved surface are as follows: Take one pound of extract of logwood and dissolve the same in one gallon of water, then add to the solution one pound of soda and one pound of mineral salt, using one of the salts of iron or copper, preferably sulphate of copper. The mixture thus obtained is then placed in a filter. After the solution has been filtered the precipitate is removed from the device employed for filtering and then dried, after which the precipitate is ready for

use. To every two pounds of precipitate thus obtained we add one pound of oil and one pound of wax, and then grind the mixture in a warm state in what is commonly known as a "paint" or other suitable grinding mill. The heated mixture thus obtained is then applied to tissue-paper or other suitable paper or fabric by means of a sponge or other suitable transferring device.

The paper or fabric to which our improved surface is to be applied is placed upon a heated table, by preference formed of iron, and heated by steam; but this may be varied.

In place of employing oil or wax, or both combined, we can employ any other suitable oleaginous matter or combination of oleaginous matter having equivalent or approximately-equivalent properties.

Having thus described our invention, what we claim, and desire to secure by letters patent, is—

A sheet of material or fabric coated with a composition composed of a precipitate of dye-matter, obtained as described, in combination with oil, wax, or oleaginous matter, substantially as and for the purposes set forth.

In witness whereof we have hereunto set our hands this 20th day of March, 1886.

JOHN T. UNDERWOOD.
FREDERICK W. UNDERWOOD.

Witnesses:
S. D. DITCHETT.
W. COLBORNE BROOKES.

296 UNDERWOOD *vs.* GERBER.

Complt's Exhibit Gerber's Label.—Febry. 23, 1888.
J. A. S., *Spec. Exr.*

GERBER'S
Carbon-Paper & Ribbons,
HENRY GERBER, Sole Manufacturer.
Office: 78 Nassau Street, New York City.
Factory: BROOKLYN, N. Y.

[Border around advertisement in red ink in original.]

297 (*Copy of Notice Referred to on Page* 190 *of Defendants' Record.*)

Arthur C. Fraser, expert in patent causes, New York. Foreign member of Inst. of Patent Agents, London.
George H. Fraser, New York. Arthur S. Browne, attorney-at-law, Washington.

Office of Arthur C. Fraser & Co., solicitors of American and foreign patents, Temple court, 5 & 7 Beekman street.

NEW YORK, *Sept.* 26, 1887.

Henry Gerber, 78 Nassau street, city.

DEAR SIR: We have to notify you that in making and selling your typewriter carbon paper for manifolding your are infringing the patent of our clients John T. Underwood and Frederick W. Underwood Nos. 348,072 and 348,073, dated August 24, 1886, for transfer composition and manifolding surfaces for typewriting.

We are instructed to warn you that unless you immediately cease this infringement by withdrawing your infringing goods from the market legal proceedings will be at once instituted against you for an injunction and an accounting of profits and damages.

We trust that your infringement of these patents has been committed without knowledge of our client's rights and that upon being thus apprised thereof you will be disposed to cease further violation of their patents.

Very truly, ARTHUR C. FRASER & CO.

(Similar notice addressed to A. Andrews.)

298

When the registered letter or parcel accompanying this card is delivered, the Postmaster will require signature to the receipt on the other side, also on his record of registered deliveries, and mail this card without cover to address below.

A penalty of $300 is fixed by law for using this card for other than official business.

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OFFICIAL BUSINESS. Post Office at

Stamp here name of Post Office and date of delivery.

NEW YORK.
SEPT. 27,
4:30 P. M.
'87.

RETURN TO:

Name of Sender *A. C. Fraser & Co.,*

Street and Number, or Post Office Box. *Temple Court.*

Post Office at NEW YORK,
County of New York, State of New York.

REVERSE SIDE OF ABOVE CARD.

REGISTRY RETURN RECEIPT sent *SEP. 26, 1887*, 18 .

Reg. No. 90703 . **From Post Office at** NEW YORK, N. Y.

**Reg. Letter / Reg. Parcel†* *Addressed to* *H. Gerber,*

Post Office at *78 Nassau.*

After obtaining receipt below, the Postmaster will mail this Card, without cover and without postage, to address on the other side.

RECEIVED THE ABOVE DESCRIBED REGISTERED **LETTER. / PARCEL.†*

(SENDER'S NAME ON OTHER SIDE.)

Sign on dotted lines to the right.

When delivery is made to other than addressee, the name of both addressee and recipient must appear.

Henry Gerber, *5 4 1 9 7*

per W. F. Stetler.

* Erase letter or parcel according to which is sent.

Similar card received signed: "A. Andreas."

† Erased in copy.

299 DEF'TS' EX. JOHN UNDERWOOD PAT. OF 1863. H. L. B., Spec. Exam. May 9, 1888.

UNITED STATES PATENT OFFICE.

JOHN UNDERWOOD, of London, England, assignor to Waldo Maynard and Charles R. Thayer, of Boston, Massachusetts.

Improved Process of Copying Writings, Maps, &c.

Specification forming part of Letters Patent No. 38086, dated March 31, 1863.

To all whom it may concern:

Be it known that I, John Underwood, of London, England, have invented an improved method of printing and of preparing materials employed therein; and I do hereby declare the same to be fully described in the following specification.

The object of my invention is to facilitate the printing or production of copies of printed, written, or other characters or marks which have been impressed or otherwise produced upon the surface of paper, parchment, or other similar material, and I effect this by preparing the substance of which the printed, written, or other characters or marks are composed, and also the paper, parchment, or other material upon which they are to be copied, in such manner that when the latter, after having been moistened, is brought in contact with the former a chemical action shall take place, by means of which copies of the printed, written, or other characters or marks shall be produced upon the prepared paper, parchment, or other material.

In carrying my invention into effect I print, write, or otherwise mark upon paper (supposing paper to be the material used) with a solution of an extract of logwood, or with a material or varnish soluble in water or other like suitable vehicle, and when with the latter I dust or throw over it extract of logwood in powder, and I treat the paper (supposing paper to be the material used for this purpose also) upon which the impressions are to be obtained with a solution of neutral chromate of potash or other agent which will have a like effect by precipitating a colored material, where the extract or powder of logwood is absorbed, and use the paper so treated in a damp state, the impression being taken in any suitable manner.

I do not confine myself to the use of logwood and chromate of potash, or to chemical agents producing a chemical action analogous to theirs, as the chemical agents employed to produce the desired effects may be greatly varied, and the nature of the chemical action produced depends upon the agents employed. I sometimes, for example, prepare the copying-paper with a chemical substance which shall produce the copy when in a damp state. It is brought in contact with the printed, written, or other characters or marks by dissolving or partially dissolving the substance used in producing the char-

acters or marks, which is the case if I prepare the copying-paper with a solution of oxalic acid and the characters or marks with Prussian blue freshly prepared; or I prepare the copying-paper with a chemical substance which shall produce the copy when brought into contact with the characters or marks by chemical precipitation, which is the case if I prepare the copying-paper with a solution of gallic acid and the characters or marks with a solution of sulphate of iron; or I prepare the copying-paper with a chemical substance which shall produce the copy when brought in contact with the characters or marks by chemical reaction, which is the case if I prepare the copying-paper with a solution of perchloride of iron and the characters or marks with a solution of sulpho-cyanide of potassium; but while the means employed for producing the desired effects may be varied, I prefer the following for general use: I dampen the paper, parchment, or other material which I desire to copy upon with a solution of two hundred grains of the yellow or neutral chromate of potash dissolved in one gallon of distilled water, and either use it immediately or dry it, and subsequently dampen it with water, as it is required for use. I then prepare the material which I use for producing the characters or marks, and which may be called "copying-ink," by simply dissolving (in a water-bath) pure extract of logwood in distilled water; or for printing, I use a varnish or other similar material soluble in water, and dust or throw over it powdered extract of logwood. If I desire to take twenty copies from an original, I use about six pounds of the pure extract of logwood to a gallon of distilled water; but a larger number of copies may be taken by dusting or throwing over the original before the ink has thoroughly dried a powder composed of five parts of powdered extract of logwood, one part of powdered gum-arabic, and one part of powdered tragacanth. When I desire to print from an original, in producing which I have used ink prepared as before described, I proceed by dampening six sheets of paper, prepared as before described, and having taken off all superfluous moisture with good blotting-paper, I place the original upon the upper sheet and press the whole for about a half a minute in a copying-press. I next remove the original, and in its place put six other sheets of the prepared paper in a damp state, and subject the whole to pressure for about a quarter of an hour. I then take five other prepared sheets in a damp state, and, having laid the original upon them, press them together for about two minutes, then replace the original by three other prepared and damped sheets, and press the whole together for about a quarter of an hour. The extract of logwood so acts upon the neutral chromate of potash that I thus obtain twenty good clear facsimiles of the original matter or design.

This invention is applicable to the production of copies of maps, charts, plans, and other similar prints or drawings, as well as to ordinary written and printed papers or designs.

Having now described the nature of my said invention and in what manner the same is to be performed, I declare that I claim—

1. The method of printing or obtaining copies of documents, forms, maps, plans, designs, or any other characters or marks which

may be produced upon paper, parchment, or other similar material, by forming these characters or marks of a prepared ink and bringing them in contact with prepared paper under pressure, the ink and paper being prepared in such manner that when the two are brought together a chemical action takes place, whereby copies of the said characters or marks are produced, as hereinbefore described.

2. Preparing copying-ink and copying-paper in the manner and for the purposes hereinbefore described.

JOHN UNDERWOOD.

Witnesses:
WILLIAM STEERS.
GEORGE HAZELL.

300 DEFENDANTS' EXHIBIT HOLT'S PATENT, JUNE 2, 1888.

UNITED STATES PATENT OFFICE.

HORACE HOLT, of New York, N. Y., assignor to W. W. Secombe.

Improved Composition for Preparing Ribbons for Hand-Stamps.

Specification forming part of Letters Patent No. 47494, dated April 25, 1865.

To all whom it may concern:

Be it known that I, Horace Holt, of the city, county, and State of New York, have invented a new and improved composition for preparing ribbons for hand-stamps, &c.; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to fully understand and use the same.

In certain classes of hand-stamps ink-prepared ribbons are used, which are drawn through between the die and the bed and give the impression when the die is depressed. For the purpose of preparing these ribbons ordinary printing-ink has been used in the absence of some better composition, and a ribbon thus prepared will give about thirty (more or less) impressions on the same spot.

The composition which forms the subject-matter of this invention, and the coloring base, which is one of the aniline colors, when properly mixed and applied to the ribbons, allows of taking more than one hundred impressions from the same spot. In fact, the color seems to be inexhaustible, and it is therefore of great value for the purpose above stated.

I prepare my new composition by dissolving aniline red, or any other of the well-known aniline colors, in glycerine, or any other fatty material known as a solvent of such color or colors, and then I saturate the ribbon therewith by applying the composition to it with a brush, or by drawing the ribbon through it, or in any other suitable manner. The ribbon readily absorbs enough of the composition to serve the desired purpose, and when said ribbon is ap-

plied to a hand-stamp it gives a very large number of impressions from one spot, as above stated, and, furthermore, the aniline colors appear to penetrate into the paper and combine with the fiber thereof in such a way that an impression taken from the new ribbon is less liable to be wiped off or blotted than an impression taken from the old ribbon, which always requires some time to dry, and when rubbed immediately after it has been taken is liable to smear and produce a bad effect.

I claim as new and desire to secure by letters patent—

The within-described composition applied to a ribbon, substantially as and for the purpose set forth.

HORACE HOLT.

Witnesses:
M. M. LIVINGSTON,
C. L. TOPLIFF.

301 DEFENDANTS' EXHIBIT COWAN PATENT, JUNE 2, 1888.

UNITED STATES PATENT OFFICE.

CHARLES COWAN, of New York, N. Y.

Letters Patent No. 89738, dated May 4, 1869.

Improvement in the Preparation of Copying-Paper.

The schedule referred to in these letters patent and making part of the same.

To all whom it may concern:

Be it known that I, Charles Cowan, of the city, county, and State of New York, have invented a new and useful improvement in the preparation of copying-paper; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same.

This invention relates to an improvement in the manufacture of copying-paper in oil-colors, either with or without the addition of such chemicals, which will render the marks produced by the copying-paper indelible.

In preparing my copying-paper I first prepare a mixture of the following ingredients: Boiled linseed-oil, two parts; spirits of turpentine, one part; copal varnish, one part.

With this compound I smear the paper thinly and evenly on one side, and allow it to soak and dry for about half an hour; then I apply the coloring-matter, which I prepare as follows: For black, I take, ivory-black, four parts; pure black lead, four parts; Prussian blue, one part.

This mixture I levigate very fine in raw linseed-oil, then I thin it to the consistency of strong mucilage, with the following mixture: Oil, (pure olive,) two parts; spirits of turpentine, two parts; adding

a quarter of an ounce of beeswax to every quart of this mixture, the beeswax being incorporated with the liquids as follows: Heat the oil and turpentine in a water-bath to about 100° Fahrenheit, then take a small portion thereof and heat it in a water-bath to 200° Fahrenheit; then put in the wax, and after the wax has been quite dissolved, stir well and add it to the remainder of the quart of oil and turpentine; place all in a cool atmosphere or in cold water, and keep stirring round until quite cold.

From the coloring-matter thus prepared, I apply thin and even coats to the sheets of paper, which are then hung up on a line for about twenty-four hours, or until they are quite dry and ready for use.

If it is desired to enamel the paper thus prepared, I coat the sheets with a solution of gum-shellac in alcohol, made by dissolving a quarter of an ounce of gum-shellac in one quart of alcohol.

This solution is applied with a brush, then the paper is allowed to dry for half an hour, when it is ready for use.

For colors other than black, I reduce the quantity of spirits of turpentine in the levigating or thinning-mixture, taking only one part spirits of turpentine to two parts of oil.

For blue, I use, Prussian blue, seven parts.; white lead, one part.

For crimson, I use, carmine, seven parts; white lead, one part.

For green, I use, chrome green, seven parts; white lead, one part.

For scarlet, I use, English vermilion, seven parts; white lead, one part.

For yellow, I use, orange chrome, seven parts; white lead, one part.

If it is desired to produce indelible marks from any of these papers, I prepare a solution of, nitrate of silver, four drachms; alcohol, one pint.

This solution I mix with the preparation for coating the paper.

My copying-paper is applicable to making copies of letters, designs, or characters of any desired description, and it can be used with particular advantage in making copies of letters while the same are being written.

What I claim as new, and desired to secure by letters patent, is—

The within-described compound for preparing copying-paper, made of the ingredients herein specified, mixed together substantially in the manner set forth.

Also, treating paper first with a compound of boiled linseed-oil, spirits of turpentine, and copal varnish, then with a coloring-compound levigated with a mixture of oil, turpentine, and beeswax, substantially as described.

This specification signed by me, this 12th day of April, 1869.

CHAS. COWAN.

Witnesses:

W. HAUFF,

J. F. ALEXANDER.

302 DEFENDANTS' EXHIBIT EGERTON PATENT, JUNE 2, 1888.

UNITED STATES PATENT OFFICE.

CHARLES C. EGERTON, of Baltimore, Maryland.

Improvement in Inks for Canceling.

Specification forming part of Letters Patent No. 198,090, dated December 11, 1877; application filed October 29, 1877.

To all whom it may concern:

Be it known that I, C. Calvert Egerton, of the city of Baltimore, State of Maryland, have invented certain new and useful improvements in canceling-inks; and I hereby declare the same to be fully, clearly, and exactly described as follows:

This invention has for its object to furnish an ink for use in canceling postage and revenue stamps, which ink shall be practically indelible.

It is obvious that a coloring matter in a state of true solution is wholly inapplicable to this purpose, since excess of the solvent will entirely remove the coloring matter.

A pigment in a state of mechanical suspension, and applied to the surface of the stamp, is equally removable, since the solution of the suspending material will leave the coloring matter without attachment to the paper, and enable it to be washed or brushed away.

A theoretically perfect cancel would consist, then, in the liberation of a practically insoluble coloring matter—such as carbon—in the body of the paper of the stamp—such, for instance, as the decomposition of a hydrocarbon (turpentine) by chlorine in the paper itself. Such a process, for obvious reasons, is out of the question; but by the use of my ink equivalent results are secured by entirely different means.

I compose the ink of two or more coloring matters, one of which shall be practically insoluble, and mechanically bury it in the paper by having an abrading material as an ingredient of the ink.

To this end I compose my ink of the following ingredients: iodine, indigo, red and blue aniline, iron-rust, brick-dust, muriatic acid, and alcohol. These are taken, except the last named, in about equal proportions, and mixed with the alcohol, being thoroughly incorporated by grinding, and brought to the consistency of printer's ink, when the composition is ready for use. It is applied by the usual hand-stamp, or in any other convenient manner.

Before the cancel-mark so formed can be eradicated the material of the stamp is reduced to pulp; in a word, the reuse of the stamp is rendered impossible.

With my ink the aniline furnishes a soluble coloring matter of great intensity, while the practically insoluble indigo is carried into the body of the paper by means of the gritty or abrading materials—viz., the iron-rust and brick-dust. Before the color can be

dissolved, which is thereby practically pressed into the stamp-paper, the reagents necessary to effect such solution will inevitable destroy the stamp itself.

As a substitute for the indigo, printer's ink, or other matter containing carbon, may be used; and instead of the abrading agents named, powdered flint, or substances of similar nature may be employed.

Having thus described my invention, what I claim as new, and desire to secure by letters patent, is—

1. A canceling-ink consisting of two or more coloring materials, one of which is practically insoluble, and an abrading material, substantially as described.

2. The ink herein described, consisting of iodine, indigo, iron-rust, brick-dust, red and blue aniline, muriatic acid, and alcohol, substantially as set forth.

C. CALVERT EGERTON.

Witnesses:
R. D. WILLIAMS,
G. H. PISTEL.

303 DEFENDANTS' EXHIBIT HENDRICHS' PATENT, JUNE 2, 1888.

UNITED STATES PATENT OFFICE.

JOHN HENDRICHS, of Brooklyn, New York.

Base for Safety Lithographic Inks.

Specification forming part of Letters Patent No. 239,954, dated April 12, 1881. Application filed July 21, 1880. (Specimens.)

To all whom it may concern:

Be it known that I, John Hendrichs, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful improvements in bases for safety lithographic inks; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improved base for black ink for lithographers' use, the object of which is to prevent the altering, raising, or changing by the use of acids of any note, draft, check, or document printed therewith. To this end it is composed of the following ingredients, in and about the proportions as follows, to wit:

Drop-white	7 ounces
Copperas	2 "
Bichromate of potash	2 "
Flowers of sulphur	2 "
Black union dye	3 "
Total	16 ounces

"Black union dye," as it is termed, is composed of extract of log-wood dissolved in alcohol or hot water, or both. When put in combination with coppeas it becomes a deep heavy black, which again, when combined with flowers of sulphur and bichromate of potash, forms a black dye, which, when touched with acids, changes into a dirty red.

Drop-white (also known as "hopper-white") is a heavy oxide of zinc, which is used to give the requisite body to the compound. For printing purposes it is preferable to the lighter oxide of zinc, known as "flake-white;" but the latter may be used without changing the spirit of my invention.

In compounding the ink-base I first grind the copperas and bichromate of potash in hot water. The drop-white is then ground into it, and the sulphur added. The black union dye is then ground separately with alcohol and hot water, and when thoroughly dissolved the ingredients are mixed. A tablespoonful of muriatic acid may be added to give the ink a bright black color. The alcohol and water are now allowed to evaporate, and the dye is then ready to be ground with some ordinary printers' or lithographers' varnish for printing or lithographing purposes, as the case be.

Ink made from my improved base may be produced at a less expense than lithographers' ink now commonly used, and notes, drafts, &c., printed therewith are safe from alteration, inasmuch as the ink, as above stated, when touched with acids, will change into a dirty red.

Having thus described my invention, I claim and desire to secure by letters patent of the United States—

An improved black-ink base for lithographers' or printers' use, composed of drop-white, copperas, bichromate of potash, flowers of sulphur, and black union dye, in about the proportions named, for the purpose herein set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN HENDRICHS.

Witnesses:

LOUIS APT,
CH. W. HAUBER.

304 DEF'TS' EX. UNDERWOOD'S PRIOR PATENT. H. L. B., Spec. Exam. May 9, 1888.

UNITED STATES PATENT OFFICE.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD, of Brooklyn, New York.

Composition for Transfer-Surfaces for Producing Copies of Type-Writing.

Specification forming part of Letters Patent No. 348,072, dated August 24, 1886; application filed March 22, 1886. Serial No. 196,199. (No specimens.)

To all whom it may concern:

Be it known that we, John T. Underwood and Frederick W. Underwood, citizens of the United States, both residing at Brooklyn, in the county of Kings and State of New York, have invented an improved process of manufacturing transfer-surfaces for producing copies of type-writing, or other printed or written impressions either by means of a type-writer or other machine or device for producing printed or written impressions, of which the following is a specification:

Our invention relates to the process of producing a transfer-surface adapted to be employed upon a sheet or vehicle to take the place of the articles of trade commonly known and designated as "carbon papers" or "semi-carbon papers," which are employed by type-writers or others to produce copies of impressions either obtained by a machine or by a stylus or other writing means.

In carrying out our invention we employ in the manufacture of our improved transfer-surface dye-wood solutions or their active principles, which we filter and precipitate with alkalies and mineral salts, or with alkalies, acids, and mineral salts, or with acids or alkalies alone. After the solution has been filtered the precipitate is removed from the filtering device and dried. The precipitate is then mixed with lard, oil, and wax, or their equivalents, and the mixture is then ground together in a warm state.

The dye solutions we prefer to employ are obtained from logwood or hæmatoxylin, the active principle of logwood, Brazil wood, sapan-wood, peach-wood, madder, or its active principle—alizarine.

The proportions we find to answer well in producing our improved surface are as follows: Take one pound of extract of logwood and dissolve the same in one gallon of water, then add to the solution one pound of soda and one pound of mineral salt, using one of the salts of iron or copper, preferably sulphate of copper. The mixture thus obtained is then placed in a filter. After the solution has been filtered the precipitate is removed from the device employed and dried. To every two pounds of precipitate thus obtained we add one pound of oil and one pound of wax, and then grind the mixture in a warm state in what is commonly known as a "paint-mill," or

other suitable grinding-mill. The heated mixture thus obtained is then applied to tissue paper or other suitable paper or fabric by means of a sponge or other suitable transferring device.

The paper or fabric to which our improved surface is to be applied is placed upon a heated table, by preference formed of iron, and heated by steam; but this may be varied.

In place of employing oil or wax, or both combined, we can employ any other suitable oleaginous matter or combination of oleaginous matter having equivalent or approximately equivalent properties.

Having thus described our invention, what we claim, and desire to secure by letters patent, is—

The coloring composition herein described for the manufacture of a substitute for carbon paper, composed of a precipitate of dye-matter, in combination with oil, wax, or oleaginous matter, substantially as set forth.

In witness whereof we have hereunto set our hands this 20th day of March, 1886.

JOHN T. UNDERWOOD.
FREDERICK W. UNDERWOOD.

Witnesses:
S. D. DITCHETT.
W. COLBORNE BROOKES.

305 DEFENDANTS' EXHIBIT MIKOVINIJ ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1777. No. 1145.

Specification of Anthony Mikovinij.

Composition for dressing and bleaching hemp, flax, &c.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1856.

Price, 3*d*.

305*a*

[British coat of arms.]

A. D. 1777. No. 1145.

Composition for Dressing and Bleaching Hemp, Flax, &c.

Mikovinij's specification.

To all to whom these presents shall come, Anthony Mikovinij, of Lewisham, in the county of Kent, Esquire, send greeting.

Whereas his most excellent majesty King George the Third, by his letters patent, bearing date at Westminster, the twenty-third day of January, in the seventeenth year of his reign, did give and grant

unto me, the said Anthony Mikovinij, his special licence, full power, sole priviledge and authority, that I, the said Anthony Mikovinij, my executors, administrators, and assigns, should and lawfully might, during the term of years therein expressed, make, use, exercise, and vend, within that part of his majesty's Kingdom of Great Britain called England, his dominion of Wales, and town of Berwick-upon-Tweed, my invention of "a certain new composition for the manufacturing, improving, dressing, and bleaching hemp, flax, and other vegetable substances, and hempen and other cloth and yarn;" in which said letters patent is contained a proviso obliging me, the said Anthony Mikovinij, by instrument in writing under my hand and seal, to cause a particular description of the nature of my said invention, and in what manner the same is to be performed, to be inrolled in his majesty's high court of chancery within four calendar months next after the date of the said letters patent, as in and by the said letters patent, relation being thereunto had, may more fully appear.

Now know ye, that in compliance with the said proviso, I, the said Anthony Mikovinij, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is described and ascertained in manner and form following, that is to say:—

305*b* The composition consists of tartar, saltpetre, and pearl, or any other ashes, or any other alkaline, tartarous, or nitrous substances in equal quantities. These are to be fluxed, and after fluxion are to be dissolved in water, to which water is to be added as much soap in quantity as of the other ingredients together. The hemp, flax, cloth, or other substance, is to be boiled or steeped in the water in which the aforesaid ingredients have been so dissolved and then dressed in the usual manner.

In witness whereof, I have hereunto set my hand and seal, this nineteenth day of April, in the year of our Lord one thousand seven hundred and seventy-seven.

ANTONY MIKOVINIJ. [L. S.]

Sealed and delivered (being first duly stampt) in the presence of
JOHN TENNANT,
JOHN MORRIS,
Clerks to Messrs. Exley and Crispin, Lincoln's Inn.

Graves. And be it remembered, that on the nineteenth day of April, in the year of our Lord 1777, the aforesaid Anthony Mikovinij came before our said lord the King in his chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written. And also the specification aforesaid was stampt according to the tenor of the statute made in the sixth year of the reign of the late King and Queen W^m^ and Mary of England, and so forth.

Inrolled the fifth day of May, in the year of our Lord one thousand seven hundred and seventy-seven.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1856.

306 DEFENDANTS' EXHIBIT FRITH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1798. No. 2237.

Specification of Robert Frith.

Dyeing fabrics.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1856.

Price, 4*d*.

306*a* [British coat of arms.]

A. D. 1798. No. 2237.

Dyeing Fabrics.

Frith's specification.

To all to whom these presents shall come, I, Robert Frith, of Salford, in the county Palatine of Lancaster, dyer, do send greeting.

Whereas his most excellent majesty King George the Third, by his letters patent under the great seal of Great Britain, bearing date at Westminster, the twenty-fifth of May, in the thirty-eighth year of his reign, did give and grant unto me, the said Robert Frith, my executors, administrators, and assigns, his special licence, that I, Robert Frith, my executors, administrators, and assigns, during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, my new invented "chemical method of dyeing different permanent colours upon cotton, linnen, woollen, and silk;" in which letters patent there is contained a proviso, obliging me, the said Robert Frith, under my hand and seal, to cause a particular description of the nature of my said invention, and in what manner the said is to be performed, to be inrolled in his majesty's high court of chancery within four calendar months next and immediately after the date of the said recited letters patent, as in and by the same (relation being thereunto had) may more fully and at large appear.

Now know ye, that in compliance with the said proviso, I, the said Robert Frith, do hereby declare that my new invented chemical method of dy-ing different permanent colours upon cotton, linnen, woollen, and silk, is particularly described and performed in manner following, that is to say:—

To dye a permanent straw or yellow colour upon cotton, linnen, woollen, and silk, I take one pound of the best blue galls,
306*b* and boil them in one gallon of water; if the galls be of an inferior quality I boil one pound and a half to one gallon of

water, and so in proportion to their quality, untill I have a sufficient quantity of liquor, or I dilute this liquor with water, according to the strength or fullness of colour I want to dye; I work the goods in this liquor very well, after which I pass them through aqua fortis, kill'd with block tin as follows:—I take one pint of water, with one ounce of sal amoniac dissolved in it, to which I put one pint of aqua fortis, and add to them one ounce and a half of block tin; to this preparation I mix five or six times its quantity of warm water, or I pass them through spirits of salts kill'd with block tin only, and diluted with the same quantity of water; then I wash them well in clear water, and if the colour is not sufficiently full I repeat as before untill it is, and then wash them off in soap and warm water, and dry them. Another method of dy-ing the same colours, after working the goods or cloth through the gall liquor, prepared as before, I pass them through a liquor made from ash wood or bark, ground or rasped, or from American oak wood or bark, ground or rasped, or from crab tree wood or bark, or from apple tree wood or bark, or from a liquor made from woulds or from shumack, or from two or more of the above woods or barks, or from all of them mixed together, according to the shade or fullness of the colour wanted; as it is impossible to fix an exact quantity of woods and barks for the above liquor, they must be regulated according to the goodness and strength of them, and the different shades of colour I want to dye, making it stronger or weaker as I see occasion; after which, I pass them through aqua fortis, or spirits of salts kill'd with block tin, as before, and diluted with water, then wash them well in water, after which I wash them in soap and warm water, and dry them; or I add the aqua fortis or spirits of salts, prepared as before, to the liquor, made from the woods or bark, till I can taste the spirits perfectly in the liquor in which I work the goods ten or fifteen minutes, and then wash them as before, and dry them. Or, another way to dye the said colours: I pass the goods through the gall liquor, prepared as before, then I add to the same liquor aqua fortis or spirits of salts, prepared as before with block tin, untill I can taste the spirits perfectly in the liquor, then I work them ten or fifteen minutes through this liquor again, after which I wash them off, and dry them as above. To dye a permanent nankeen colour on cotton or goods made of cotton, linnen, woollen, or silk, instead of running the goods through a liquor made from owler wood or bark, or mahogany wood or bark, ground or rasped, and then through aqua fortis kill'd with block tin and diluted with water, which method of dying this colour I found out and have practised for these ten years past, but which colour had not sufficient strength to resist the action of the air upon it.

306c I now dye it as follows, which produces as permanent and beautifull colour as any that is dyed in the East Indias, and capable of resisting the effects of the air upon it:—I now pass the goods through the gall liquor, prepared as before stated for the other colours, or diluted with water, according to the colour wanted, then through a liquor made from owler wood or bark, ground or rasped, or mahogany wood or bark, or slow tree wood or bark, or

wallnut tree wood or bark, or from elm tree wood or bark, or from poplar wood or bark, ground or rasped, or from tea, or from any two of these woods or barks, or tea, or from all of them, the quantity of ingredients and strength of the liquor to be proportion'd to the shade or fullness of the colour I have to dye; or I mix the gall liquor with this liquor prepared from the woods and barks, in proportion of half a pint or more, according to the colour, to one gallon of the woods or bark liquor; after which, I run them through aqua fortis or spirits of salts kill'd with block tin as before, and diluted with five or six times its quantity of warm water, then wash them in clear water, after that in soap and water, and then dry them. Another method of dying the above colour: I pass the goods first through the liquors prepared from the woods or barks, or tea, as before stated, or any two or more of them, then through aqua fortis or spirits of salts kill'd with block tin as before, after which I wash them well in water, and then run them through the gall liquor, made as before, and diluted with water according to the shade the colour is wanted, then through the aqua fortis or spirits of salts again, or strong allum water, or a mixture of these together, after which I wash them well in clear water, through soap and warm water, and dry them. To dye a permanent buff colour on cotton, or goods made of cotton, linnen, woollen or silk: I pass the goods through the gall liquor made as before for the other colours; then I work it through a liquor made from English oak bar, or English oak wood, ground or rasp'd, or from American oak bark or wood, ground or rasped, or from owler bark or wood, ground or rasped, or from crab tree bark or wood, ground or rasped, or from apple tree bark or wood, ground or rasped, or from shumack, or from two or more of them mix'd together, according to the shade or fullness of colour wanted; then I take out the goods and add to the liquor aqua fortis or spirit of salts kill'd with block tin as before, till I can taste the spirits perfectly in the liquor; then I pass or work them well through this liquor again for ten or fifteen minutes, after which I wash them well in water, and if the colour is not sufficiently strong, I repeat the same operation over again untill it is, and then wash them off in warm water and soap, and dry them. Another way to dye the same colour: I pass the goods through the gall liquor, made as before, or diluted with water, according to the
306*d* color I want to dye, then I work them through the liquor made from the different woods or barks, as stated before, then I pass them through aqua fortis or spirits of salts, kill'd with block tin as before, and mix'd with five or six times its quantity of warm water, after which I wash them well in clear water, and if the colour is not sufficiently strong, I repeat the same method over again untill it is, then I wash them off through warm water and soap, and dry them. To dye a permanent mud, dove, or drab colour: I take half a pint of aqua fortis and half a pint of clear water, in which I dissolve one ounce of sal amoniac, and mix them together, to which I add, by degrees, two ounces of silver, then I take of the gall liquor, or tea, prepared as for the other colors, or diluted with water, according to the fullness of colour I wish to dye, twenty parts to one of

the above spirits, and mix them together with a few drops of copperas water or oil of vitriol, kill'd with iron and water; I work the goods through this liquor, then dry them; after which, I rince them through strong American pot or pearl ashes, or lees, or from lees made of lime, or lime and ashes mix'd together; after which, I wash them well in water and dry them. Another way to dye the above colours: I take half a pint of aqua fortis, and put to it half a pint of water, to which I add two ounces of quicksilver, then I take from ten to twenty parts of the gall liquor, prepared as for the other colours, to one part of the above spirits, adding to it a few drops of copperas water, or oil of vitriol kill'd with iron and water, or aqua fortis kill'd with common tin or iron; I work the goods through this liquor, then dry them; after which, I rince them through American pot or pearl ash lees or lime lees, or through lees made from lime and ashes mixed, after which I wash them well through clear water, and dry them. Another method of dy-ing the above said mud, dove, or drab colours upon cotton, or goods made from cotton, linnen, woollen, or silk: I take half a pint of oil of vitriol, and add to it half a pint of water, in which I mix, by degrees, one pound of common salt, and half a pound of manganese; then I take gall liquor, prepared as before for the other colours, five parts to one of the above spirits, or more or less, according to the colour I want to dye; then I add to ten or twelve parts of the above liquor mixed, one part of the aqua fortis kill'd with silver, as before stated, or three parts of that kill'd with quicksilver, or in proportion, as I want it for strength, or fullness of colour; I work the goods through this liquor, then dry them, after which I rince them in American pot or pearl ashes, or lees made from lime or lime and ashes mixed together, then I wash them well, and dry them. To dye a permanent brown colour on cotton, or goods made of cotton, linnen, woollen, or silk, I pass the goods through the gall liquor, prepared as for the other colours, or I dilute it with water, according to the colour I want to dye; then I run them through the spirits made from
306e oil of vitriol, common salt, and manganese, as stated before; after which, I pass them through strong ash lees, and then through a slender liquor, made from the oxygineated muriatic acid, diluted from spirits of salts, manganese, and ashes, or from oil of vitriol, common salt, and manganese; after which, I wash them well through clear water, and dry them.

In witness whereof, I, the said Robert Frith, have hereunto set my hand and seal, this twentieth day of September, in the year of our Lord one thousand seven hundred and ninety-eight.

ROBERT FRITH. [L. S.]

Edw'd Chippindall, a master extra in chancery.

And be it remembered, that on the same twentieth day of September, in the year above mentioned, the aforesaid Robert Frith came before our lord the king in his chancery, and acknowledged the specification aforesaid, and all and everything therein contained, in form above written. And also the specification aforesaid was stamped according to the tenor of the statute in that case made and provided.

Inrolled the twenty-fourth day of September, in the year above written.

London. Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1856.

307 DEFENDANTS' EXHIBIT WEDGWOOD ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1806. No. 2972.

Specification of Ralph Wedgwood.

Producing duplicates of writings.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn, 1856. Price, 3*d*.

307*a* [British coat of arms.]

A. D. 1806. No. 2972.

Producing Duplicates of Writings.

Wedgwood's specification.

To all to whom these presents shall come, I, Ralph Wedgwood, of Charles street, Hampstead road, in the parish of Saint Pancras, in the county of Middlesex, gentleman, send greeting.

Whereas his most excellent majesty King George the Third did, by his letters patent under the great seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the seventh day of October, in the forty-sixth year of his reign, give and grant unto me, the said Ralph Wedgwood, my ex'ors, adm'ors, and assigns, his special licence, full power, sole priviledge and authority, that I, the said Ralph Wedgwood, my ex'ors, adm'ors, and assigns, during the term of fourteen years therein expressed, should and lawfully might make, use, and exercise, and vend, within that part of the United Kingdom called England, and the dominion of Wales, and town of Berwick-upon-Tweed, my invention of "an ap-

paratus for producing duplicates of writings;" in which said letters patent there is contained a proviso that if I, the said Ralph Westwood, should not particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be inrolled in his said majesty's high court of chancery within one calendar month next and immediately after the date of the said letters patent, that then the said letters patent, and all liberties and advantages whatsoever thereby granted, should utterly cease, determine, and become void, anything thereinbefore con-
307*b* tained to the contrary thereof in anywise notwithstanding, as by the said letters patent will appear.

Now know ye, that in pursuance of and compliance with the said proviso, I, the said Ralph Wedgwood, do hereby declare that the nature of my said invention, and in what manner the same is performed, is as follows:—

In writing by this mode, I make use of a prepared paper, which I call duplicate paper. This is made by thinly smearing over any kind of thin paper with any kind of oil, preferring those kinds of oil which are least liable to oxygenizement, or to be evaporated by heat. The ink made use of in this mode of writing consists of carbon, or any other colouring substance, and finely levigated in any kind of oil. This ink is to be evenly spread on leaves of thin paper, or any other thin substance, after which it should remain for five or six weeks, or any shorter period, betwixt sheets of absorbent or blotting paper, after which it is fit for use. This I call carbonated paper. Or colouring matter of any kind and in any other medium or *verticle* may be used, provided that medium be such as will admit of the colouring matter being transferred to the duplicate and writing paper; some colouring substances may likewise be used without any medium or vehicle. The pens or styles used are made of agate, ground and polished to a smooth round point. These are set in metal sockets, or sockets of any other substance; any hard substance may be substituted for the agate. To write singly in this mode, I lay a leaf of the carbonated paper upon a smooth tablet of metal, or any other smooth substance, and over that I lay a leaf of duplicate paper; upon these I write with the style, the pressure used causing a transfer of the carbon to be made upon the under side of the duplicate paper, which being transparent instantly appears through as if written upon the paper. To write double, I lay, first, a leaf of writing paper upon the tablet; second, a leaf of carbonated paper upon that; third, upon both a leaf of duplicate paper; and upon the papers so disposed I write with the style. The effect produced is a double transfer of the carbon from the carbonated paper, that on the lower surface thereof to the letter paper beneath it, and that from the upper surface thereof, to the under surface of the duplicate paper above it; if desired the tablet may be left out, yet the impression is always much stronger with it. Duplicates may also be formed by substituting any thin paper for the duplicate paper, and writing thereon with any hard substance, which will leave a trace behind it, or by using such papers as admit of a ready absorp-

tion of the colouring matter beneath. To make a farther increase of writings from an original one, I use a set of types and a type tablet; and for shortening the handwriting the types can be reduced to one figure, namely, a point, but more figures may
307*c* be used if seen convenient. These convey the idea of any letter by the position in which they may be placed in a square, or other formed figure, printed or otherwise marked on the writing paper, which square I call the basis of the letters, and the paper character paper. The precise shape and size thereof is not of importance, but may be varied at pleasure. The types consist of small tubes of metal, or any other material, round or any other shape, and (on that end which is to give the form of the letters) may be either a round point, or any other simple mark or marks, as may be thought most convenient. The types are of the same thickness from end to end, or otherwise as is found most convenient. The type tablet consists of a piece of flat metal or any other material, and of any dimensions, perforated with holes or sockets to fit the types. On the top of the type tablet is engraved or otherwise marked squares corresponding with those upon the character paper, on which it is intended to write or print. To prevent the accidental shifting of the types in their sockets, they are rubbed with a little beeswax, softened with oil or any concrete fatty substance. To prevent the types passing through the sockets of the type tablet in the act of writing, there is a plate of metal or any other hard substance, of equal size of the type tablet, fixed at the bottom of it, so that it will admit of the types being pressed to any given distance through the sockets of the type tablet found most convenient, at which place they are thereby stopped. In order to fix the types previous to taking off impressions, melted lead or any other substance my be run into the tops of those sockets which are vacated by the depression of the types which have been used for the composition of any work, the lead uniting the whole. This I call a stereotyped tablet. This stereotyped tablet may be used the same as any other type in the common mode of printing, and with a common press, observing always in printing to place the character paper so as that the squares thereof and those of the type tablet shall perfectly correspond and meet line for line when pressed upon each other; or leaves of thin character paper and carbonated paper may be laid alternately upon each other, and upon this the stereotyped tablet is pressed in any manner found most convenient. By this means, with a single pressure, a multiplicity of impressions are formed at once. To write with the new characters I take one, two, or even six layers of duplicate paper, on which is stamped or printed the basis of the letters; betwixt every two leaves I lay a leaf of carbonated paper, and over all I lay the type tablet, each square of which must be exactly over the squares or figures in the character paper so arranged, and when thus laid with the point of a metal or other hard-pointed style, I press down each type which I may require to form *or* word, from which act six copies are produced on the papers underneath; and when the
307*d* types are fixed, as before directed with lead, a stereotyped tablet is formed, from which other impressions may be printed

in any quantity. After melting out the lead the types may all be replaced in their respective sockets by gently pressing on their points a metal or wooden tablet, which will cover the whole of them at once; the type tablet is then ready for the composition of a second page of any work to be printed therewith.

In witness whereof, I, the said Ralph Wedgwood, have hereunto set my hand and seal, the third day of November, in the forty-seventh George Third, and in the year of our Lord one thousand eight hundred and six.

RALPH WEDGWOOD. [L. S.]

Harvey. And be it remembered that on the third day of November, in the year of our Lord 1806, the aforesaid Ralph Wedgwood came before our said lord the King in his chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written. And also the specification aforesaid was stampt according to the tenor of the statute made for that purpose.

Inrolled the third day of November, in the year of our Lord one thousand eight hundred and six.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1856.

308 DEFENDANT'S EXHIBIT KURTZ ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1847. No. 11544.

Specification of Clemence Augustus Kurtz.

Coloring Matter for Dyeing and Printing Fabrics.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1857. Price, 3*d*.

308*a* [British coat of arms.]

A. D. 1847. No. 11544.

Coloring Matter for Dyeing and Printing Fabrics.

Kurtz's specification.

To all to whom these presents shall come, I, Clemence Augustus Kurtz, of Manchester, in the county of Lancaster, manufacturing chemist, send greeting.

Whereas her present most excellent majesty Queen Victoria, by her letters patent under the great seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the twenty-

sixth day of January, one thousand eight hundred and forty-seven, and now last past, did, for herself, her heirs and successors, give and grant unto me, the said Clemence Augustus Kurtz, my ex'ors, adm'ors and assigns, her especial license, that I, the said Clemence Augustus Kurtz, my ex'ors, adm'ors, and assigns, or such others as I, the said Clemence Augustus Kurtz, my ex'ors, adm'ors, or assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should and lawfully make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, and in all her majesty's colonies and plantations abroad, my invention of "a new manufacture of a certain coloring matter to be used in the dyeing or in the printing of woollen, cotton, silk, and other fabrics;" in which said letters patent is contained a proviso, obliging me, the said Clemence Augustus Kurtz, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be enrolled in her majesty's high court of chancery within six calendar months next and immediately after the
308*b* date of the said recited letters patent, as in and by the said letters patent, reference being thereunto had, will more fully and at large appear.

Now know ye, that in compliance with the said proviso, I, the said Clemence Augustus Kurtz, do hereby declare the nature of my said invention, to consist in obtaining a substantive coloring matter from aloes or extract of logwood for dyeing or printing a bronze or brown color by the action of nitric or nitrous acid upon the aloes or extract of logwood in the following manner:—

Into a vessel or boiler of one hundred gallons capacity ten gallons of water and one hundred and thirty-two pounds weight of aloes as imported are put, and heated together until the aloes are dissolved; eighty pounds of nitric or nitrous acid is then added in small portions at a time, to prevent the dissengagement of such a quantity of nitrous gas suddenly as would throw part of the contents out of the boiler. When all the acid is added, and the disengagement of gas has ceased, ten pounds of liquid caustic, soda, or potash of commerce of about thirty degrees is added, so as to neutralize any undecomposed acid remaining in the mixture as well as to facilitate the use of the mixture subsequently in dyeing and printing. If it be wished to have the coloring matter in a dry state, the above mixture may be incorporated with one hundred pounds weight of china clay, and then dried either in stoves or in a current of air. In the manufacture of the coloring matter from extract of logwood I employ that substance instead of aloes, using the other substances and the proportions above mentioned. The coloring matter is used in dy-ing by dissolving or diffusing a sufficient quantity, according to the shade required, in a vessel of water, adding a sufficient quantity of hydrochloric acid or of tartar of commerce to neutralize the alkali contained in the mixture, and to leave the dye bath slightly acidulated. The material to be dyed is introduced into the bath, which is made to boil until the desired shade is ob-

tained. The coloring matter is used in printing by dissolving or diffusing the mixture in a sufficient quantity of water, according to the shade required, thickening the same with gum or the ordinary agents used by printers for thickening their colors, adding, as in dyeing, a sufficient quantity of hydrochloric acid or tartar of commerce, or any other suitable super salt. After printing with the color thus prepared, it is necessary to expose the stuffs or cloth to the operation of steaming as practiced by printers for some other colours, with a view to fix the colour on the cloth.

Having now described the nature of my invention, and the manner in which the same is to be performed, I declare that I do not claim as of my invention the manufacture from aloes or logwood, by the action of nitric or nitrous acid, of any other colouring matter than a substantive colouring matter suitable for dyeing
308c or printing a bronze or brown colour; but what I claim as my invention is, the manufacture of a substantive colouring matter for dyeing or printing a bronze or brown colour from aloes and extract of logwood by means of nitric or nitrous acid, in the manner above described.

And this my invention being, to the best of my knowledge and belief, entirely new and never before used within that part of her said majesty's United Kingdom of Great Britain and Ireland called England, her dominion of Wales, and town of Berwick-upon-Tweed, or within her majesty's colonies and plantations abroad, I do hereby declare this to be my specification of the same, and that I do verily believe this my specification doth comply in all respects fully and without reserve or disguise with the proviso in the said hereinbefore in part recited letters patent contained; wherefore I do hereby claim to maintain exclusive right and privilege to the said invention.

In witness whereof, I, the said Clemence Augustus Kurtz, have hereunto set my hand and seal, this twenty-fourth day of July, in the year of our Lord one thousand eight hundred and forty-seven.

CLEMENCE AUGUSTUS [L. S.] KURTZ.

And be it remembered, that on the twenty-fourth day of July, in the year of our Lord 1847, the aforesaid Clemence Augustus Kurtz came before our said lady the Queen in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written. And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose. Rose.

Enrolled the twenty-fourth day of July, in the year of our Lord one thousand eight hundred and forty-seven.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1857.

309 DEFENDANTS' EXHIBIT SWAN ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1856. No. 342.

Specification of Charles Swan and George Frederick Swan.

Coloring matter for writing, staining, or dyeing.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn, 1856.
Price, 3*d*.

309*a* [British coat of arms.]

A. D. 1856. No. 342.

Coloring Matter for Writing, Staining, or Dyeing.

Letters patent to Charles Swan and George Frederick Swan, of 49, High St., in the borough of Southwark, ink manufacturers, for the invention of "an improved coloring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid."—A communication.

Sealed the 30th May 1856, and dated the 9th February 1856.

Provisional specification left by the said Charles Swan and George Frederick Swan at the office of the commissioners of patents, with their petition, on the 9th February 1856.

We, Charles Swan & George Frederick Swan, of 49, High St., in the borough of Southwark, ink manufacturers, do hereby declare the nature of the said invention for an improved coloring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid, to be as follows, that is to say:—

Our said invention has reference to the production of a permanent black coloring matter applicable to the purposes of writing, dyeing, or staining, and possessing, among other advantages, that of not corroding or having its color affected by steel or other metallic pens; and we carry the said invention into effect by employing a solution of bichromate of potash, which we mix with a suitable quantity or quantities of the following ingredients, namely, subcarbonate of potash, chlorate of potash, perchloride of mercury, or corrosive
309*b* sublimate, and spirit of ammonia, and we then apply the composition above described to an extract of logwood, of which the color will be thereby so fixed and modified that the liquor when strained off, or otherwise purified, will be found suitable either

for writing, staining, or dyeing. And the coloring matter of the said liquor may also be obtained, when it is desired, in a solid form, by any suitable processes for combining the above-mentioned ingredients, and the same subsequently converted into the form of a coloring fluid, as it may be required. And the coloring fluid obtained in either manner may be converted into a copying fluid by the addition of any thickening ingredients which have heretofore been employed, or which may be found applicable for such a purpose; and in like manner the above coloring matter, when obtained in a solid form, may be applied to the production of a copying fluid by any suitable process of dilution, and the addition of thickening ingredients, as above described.

Specification in pursuance of the conditions of the letters patent, filed by the said Charles Swan and George Frederick Swan in the Great Seal Patent Office on the 8th August 1856.

To all to whom these presents shall come, we, Charles Swan and George Frederick Swan, of 49, High St., in the borough of Southwark, ink manufacturers, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the ninth day of February, in the year of our Lord one thousand eight hundred and fifty-six, in the nineteenth year of her reign did, for herself, her heirs and successors, give and grant unto us, the said Charles Swan and George Frederick Swan, her special license that we, the said Charles Swan & George Frederick Swan, our executors, administrators, and assigns, or such others as we, the said Charles Swan and George Frederick Swan, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for an improved coloring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid, upon the condition (amongst others) that we, the said Charles Swan & George Frederick Swan, our executors or administrators, by an instrument in writing under our, or their, or one of their hands and seals, should particularly describe and ascertain the
309c nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that we, the said Charles Swan and George Frederick Swan, do hereby declare the nature of our said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—

Our said invention has reference to the production of a permanent black coloring matter applicable to the purposes of writing,

staining, or dyeing, and which possesses, among other advantages that might be instanced, that of not corroding steel pens or other metallic pens, or instruments with which it may require to be brought into contact, and of not having its color affected by the said substances; and we carry the said invention into effect by employing an extract of logwood or hæmatoxylon campechianum, and in order to convert the color of the said extract to a suitable jet black color, and to render the same color permanent, and to give the solution the fluidity, indelibility, and other qualities which are requisite to our above invention, we prefer to employ a mixture of the following materials, namely, bichromate of potash, perchloride of mercury, otherwise called corrosive sublimate, subcarbonate of potash, chlorate of potash, and spirit of ammonia, which said materials may be employed in different proportions, which should depend in a great measure on the particular objects to which it is intended to apply the coloring matter. And in place of the perchloride of mercury, or corrosive sublimate, we have above mentioned, may be substituted vinegar, or other acid substances, which have hitherto been employed or may be employed in ordinary inks; but the employment of the other above named substances in combination with each other, is the characteristic of our improved coloring matter. And the said coloring matter may be obtained in a liquid form by introducing the salts above mentioned into a liquid extract of logwood, and straining or otherwise purifying, the fluid in any suitable manner; or the said coloring matter may be obtained in a solid form by combining the aforesaid salts with a solid preparation of extract of logwood, or by evaporation or distillation from the liquid coloring matter above described, and the solid coloring matter may be kept on hand till required, and reduced to a liquid form by dilution with any suitable proportion of water. And the coloring fluid obtained in any of the modes hereinbefore set forth in the form of an ink, may be converted into a copying fluid by the addition of any saccharine or other thickening ingredients hitherto employed, or which may be found applicable; it may also be obtained from the solid coloring matter by any suitable process.

309*d* Having now fully described the nature of this our said invention, and the methods in which we propose to carry the same into effect, we would have it clearly understood, that we do not claim the general employment of extract of logwood, or of any one of the materials hereinbefore mentioned, in making inks or coloring matters, since some of the said materials have already been used in other combinations for the same purposes; but that which we do claim as new and original in this our said invention is, the total combination of the five constant ingredients above set forth, namely, extract of logwood, bichromate of potash, chlorate of potash, subcarbonate of potash, and spirit of ammonia, employed in conjunction either with corrosive sublimate or with vinegar, or any other acid substances, for the purpose of forming a solid or fluid coloring matter by the processes and for the purposes above set forth.

In witness whereof, we, the said Charles Swan and George Fred-

erick Swan, have hereunto set our hands and seals, this eighth day of August, in the year of our Lord 1856.

CHARLES SWAN. [L. S.]
GEORGE FREDERICK SWAN. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1856.

310 DEFENDANTS' EXHIBIT UNDERWOOD AND BURT ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1856. No. 2206.

Specification of John Underwood and Frederic Valentine Burt.

Copying inks for printing.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1857.

Price, 4*d*.

310*a* [British coat of arms.]

A. D. 1856. No. 2206.

Copying Inks for Printing.

Letters patent to John Underwood and Frederic Valentine Burt, of Fish Street hill, in the city of London, stationers and printers, for the invention of "the manufacture of copying inks for printing."

Sealed the 6th February 1857, and dated the 19th September 1856.

Provisional specification left by the said John Underwood and Frederic Valentine Burt at the office of the commissioners of patents, with their petition, on the 19th September 1856.

We, John Underwood and Frederic Valentine Burt, of Fish Street hill, in the city of London, stationers and printers, do hereby declare the nature of the said invention for "the manufacture of copying inks for printing," to be as follows:

Our invention consists in manufacturing soluble ink or inks for printing, which after having been used in printing become dissolved by the application of or being exposed to moisture or wet, in such manner and to such extent that one or more copies may be taken therefrom, as is now ordinarily done in taking impressions from documents and papers, written with what is known as copying ink.

It will be evident that various ingredients may be employed for the purpose of our invention; among others, we have found the fol-

lowing to answer well, in or about the proportions named:—
310*b* Nut-galls, 14 lbs.; sulphate of iron, 6 lbs.; gum senegal, 12 lbs.; treacle, 6 lbs.; soap, 3 lbs.; lampblack, 6 lbs.; Prussian blue, 3 lbs.; water, 15 gallons.

When the above ingredients are used, the nut-galls are first bruised, and then boiled for about three hours, more or less, in half the above-named quantity of water, and the clear liquid drawn off. The gum and sulphate of iron are separately dissolved in the remaining quantity of water, and the whole is then mixed with the decoction of nut-galls, and exposed for about 21 days, more or less, to the atmosphere, when the supernatant liquid is drawn off from the deposited matters and sediment. The treacle and soap are now added to the liquid thus drawn off, and the whole evaporated to a syrupy consistency, and then the lampblack and Prussian blue are mixed with it.

The above ingredients will form a black ink; but ink of any desired color may be made by using coloring matter, as now practised in the manufacture of colored printing inks. The above is one of the modes of manufacture.

Specification in pursuance of the conditions of the letters patent, filed by the said John Underwood and Frederic Valentine Burt in the Great Seal Patent Office on the 19th March 1857.

To all to whom these presents shall come, we, John Underwood and Frederic Valentine Burt, of Fish Street hill, in the city of London, stationers and printers, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the nineteenth day of September, in the year of our Lord one thousand eight hundred and fifty-six, in the twentieth year of her reign, did, for herself, her heirs and successors, give and grant unto us, the said John Underwood and Frederic Valentine Burt, her special licence that we, the said John Underwood and Frederic Valentine Burt, our executors, administrators, and assigns, or such others as we, the said John Underwood and Frederic Valentine Burt, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "the manufacture of copying inks for printing," upon the condition (amongst others) that we, the said John Underwood and Frederick Valentine Burt, our executors or administrators, by an instrument in writing under our,
310*c* or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that we, the said John Underwood and Frederic Valentine Burt, do hereby declare the nature of our said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

Our invention consists in manufacturing ink or inks for printing, in such a manner that after having been impressed or deposited by printing upon the surface of paper or other material, then such deposited ink may become soluble, or partially soluble, by the application of or being exposed to moisture or wet, and to such extent that one or more copies may be taken therefrom upon moistened or damp paper, as is now ordinarily done in taking impressions from documents and papers written with what is known as copying ink.

In order to effect this object, we cause the ink to be made of coloring matters or pigments necessary to produce the intended color, to which we add a material or mixture of materials requisite for causing the particles of the coloring matter or matters to cohere, and also to adhere to the surface upon which the ink is to be printed; and also a material or mixture of materials which will cause the ink after being so printed to be not only capable of drying when requisite, but also capable of being afterwards rendered sufficiently soft and soluble by moisture, as to yield impressions by being pressed in contact with surfaces capable of taking such impressions.

Many materials or ingredients may be used for effecting these objects, and the nature or description of materials suitable for these purposes will be shewn by the following description of the mode of making inks according to our invention:—

For the purpose of making a black ink, we take of nut-galls, 14 lbs.; of sulphate of iron, 6 lbs.; of gum senegal, 12 lbs.; of treacle, 6 lbs.; of soap, 3 lbs.; of lampblack, 6 lbs; of Prussian blue, 3 lbs.; and of filtered rain water, 15 gallons. The nut-galls are first bruised, and then boiled for about 3 hours, more or less, in half the above-named quantity of water, and the clear liquid drawn off. The gum and sulphate of iron are separately dissolved in the remaining quantity of water, and the whole is then mixed with the decoction of nut-galls, and exposed for about 21 days, more or less, to the atmosphere, when the supernatant liquid is drawn off from the deposited matters and sediment. The treacle and soap
310*d* are now added to the liquid thus drawn off, and the whole evaporated in a water bath to nearly the consistency of ordinary printing ink, and then the lampblack and Prussian blue are mixed with it. The above ingredients will form a black ink; but ink of other colors may be made by using a soluble coloring material or materials, such as sulphate of indigo or carmine, dissolved in ammonia, either separately or combined with coloring matter, such as now employed in the manufacture of colored printing inks, in lieu of the nut-galls, sulphate of iron, lampblack, and Prussian blue used in making ink, as above described.

The following is another mode of making a black ink for the purpose of our invention:—1st, take 12 lbs. nut-galls, and 6 lbs. of sulphate of iron; bruise the nut-galls very fine, and boil them in

12 gallons water 48 hours consecutively, adding water from time to time to make up what is lost by evaporation; then add the sulphate of iron, previously dissolved in 3 gallons of water, expose for 21 days, more or less, to the atmosphere, and strain through cloth, and filter through paper. Take the clear liquid, and add fused caustic potash till the solution will turn reddened litinus paper blue, boiling all the time. Filter again, and evaporate the clear liquid in a water bath to the consistency of a druggist's ordinary extract.

2nd, take of the extract so prepared, 12 oz.; soft soap, 6 oz.; subcarbonate of potash, 2 lbs.; distilled water, 5½ imperial pints; powdered gum tragacanth, 4 oz.: powdered gum arabic, 1½ lbs.; treacle, 2 lbs.; spirit black, 1 lb. We now mix the tragacanth and gum arabic thoroughly together, and add 2 pints of the distilled water to them and the 12 oz. of extract previously dissolved in 1 pint of the distilled water, and having incorporated these thoroughly together, we then stir the treacle with them. We then boil together the soft soap and 1 lb. of the subcarbonate of potash in a pint of the distilled water, and add this to the former mixture, and while stirring the whole together, we add gradually in small quantities the remaining 1 lb. of subcarbonate of potash, dissolved in the remaining 1½ pint of water. We now grind the spirit black with the whole, in the ordinary way of manufacturing printing inks.

We have thus produced our black ink, but ink of other colors may be made by using other coloring matters, as aforesaid. When ink manufactured in this way has been deposited by printing upon the surface of paper or other fit material for printing it upon, it will dry upon being exposed to warm dry air; and when it is desired to obtain impressions from such printed surfaces, a damp or moist surface suitable for receiving the intended impression or impressions is placed upon or applied thereto, such as the thin paper used for making ordinary transfer copies in a copying ma-
310e chine, and then the damp or moist surface is to be pressed into close contact with the printed surface, so as to receive the intended impression.

Subsequent impressions may be taken in the same way if the quantity of ink deposited in the first instance shall have been sufficiently large for that purpose, but such subsequent impressions will of course become more and more faint by the repeated abstraction of ink from the printed surface.

Having thus described the nature of our said invention, and the manner in which the same may be performed, we declare that we do not claim the mode of printing by transfer, as above described; but that we claim as of our said invention, the mode of manufacturing inks for printing, composed of the requisite coloring matters mixed with materials, so as to cause such inks to be not only capable of printing properly, and of drying after being printed or deposited upon the surface of paper or other material, but also to be capable of yielding an impression or impressions by pressure against damp or moist surfaces.

In witness whereof, we, the said John Underwood and Frederic

Valentine Burt, have hereunto set our hands and seals, this nineteenth day of March, one thousand eight hundred and fifty-seven.

JOHN UNDERWOOD. [L. S.]
FRED. VALENTINE BURT. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent Majesty. 1857.

311 DEFENDANTS' EXHIBIT ROBERTS & DALE ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1857. No. 1988.

Specification of Thomas Roberts and John Dale.

Obtaining pigments from dye-woods and applying the same to printing paper-hangings.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1858.

Price, 3*d*.

311*a* [British coat of arms.]

A. D. 1857. No. 1988.

Obtaining Pigments from Dye-Woods and Applying the Same to Printing Paper-Hangings.

Letters patent to Thomas Roberts and John Dale, of Manchester, in the county of Lancaster, manufacturing chemists, for the invention of "improvements in obtaining pigments from dye-woods, and in the application of a pigment to printing paper-hangings."

Sealed the 12th January 1858, and dated the 17th July 1857.

Provisional specification left by the said Thomas Roberts and John Dale at the office of the commissioners of patents, with their petition, on the 17th July 1857.

We, the said Thomas Roberts and John Dale, of Manchester, in the county of Lancaster, manufacturing chemists, do hereby declare the nature of the said invention for "improvements in obtaining pigments from dye-woods, and in the application of a pigment to printing paper-hangings," to be as follows:—

Our invention relates to obtaining pigments from dye-woods, such as barwood, sandal-wood, camwood, &c., and the principle we proceed upon is, to immerse them in a fluid containing a substance or substances which will take up the coloring matter as it is dissolved. To illustrate this, we will suppose it desired to obtain a pigment from barwood; for this purpose, the substance is ground and then

immersed in a fluid to which a salt of tin is added, the coloring matter then dissolves, and is taken up by the mordant, as it may be called, and thus the process may be continued as long as may be desired.

Also our invention consists in the use of the barwood itself as a pigment, for which purpose it is ground sufficiently fine and
311*b* immersed in any liquid which will develop its tinctorial quality; this will be found to have taken place by the use of the first part of our invention, and the two may therefore be used as a combined operation.

Also our invention consists in the application of a pigment obtained from barwood to the purpose of printing paper-hangings, which pigment may be obtained as above described, or by other means.

Specification in pursuance of the conditions of the letters patent, filed by the said Thomas Roberts and John Dale in the Great Seal Patent Office on the 16th January 1858.

To all to whom these presents shall come, we, Thomas Roberts and John Dale, of Manchester, in the county of Lancaster, manufacturing chemists, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the seventeenth day of July, in the year of our Lord one thousand eight hundred and fifty-seven, in the — year of her reign, did, for herself, her heirs and successors, give and grant unto us, the said Thomas Roberts and John Dale, her especial license that we, the said Thomas Roberts and John Dale, our executors, administrators, and assigns, or such others as we, the said Thomas Roberts and John Dale, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in obtaining pigments from dye-woods, and in the application of a pigment to painting paper-hangings," upon the condition, amongst others, that we, the said Thomas Roberts and John Dale, or one of us, by an instrument in writing under our hands and seals, or under the hand and seal of one of us, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Thomas Roberts, do hereby declare the nature of our said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—

311*c* Our invention relates to obtaining pigments from dye-woods, and the principle we proceed upon is, to immerse

them in a fluid containing a substance or substances which will take up the coloring matter as it is dissolved.

Also our invention consists in the use of barwood as a pigment, and in the application of a pigment obtained from barwood to the purpose of printing paper hangings.

A method we adopt for carrying out the first part of our invention is as follows:—Supposing it desired to produce a pigment from barwood; in a vessel of wood or wood lined with lead and containing from five to six hundred gallons of water we place about seven hundredweight of the ground or chipped wood. In this vessel is a coiled pipe with perforations, through which steam is blown so as to raise the fluid to the boiling point. This having been done, fifty pounds of per-sulphate of tin are added, from which the oxide is precipitated by the dilution, as is well understood by chemists; the whole is then stirred, and the heat kept up for three or four hours, at the end of which time coloring matter will have been extracted from the wood and taken up by the oxide of tin, forming with it a bright red suitable for a pigment, but mixed with particles of the ground or chipped wood; upon the fluid, however, being kept still, the latter will fall first to the lower part of the vessel, and the supernatant liquor containing the dyed oxide is drawn off into cisterns; it is then run through sieves to separate any remaining particles of wood, and subsequently washed, to free it from adhering acid resulting from the process, after which it is run onto filters, and the retained pulp is fit for use for printing on cloth, paper, or other substance, or for being otherwise applied as a pigment If desired, however, the pulp may be dried and used in that state as an article of commerce.

We have above described a method of carrying out this part of our invention, which we have found to answer, but the quantities of the substances mentioned may be varied and the mode of using them modified; for instance, the oxide of tin may be precipitated in a separate vessel or otherwise obtained, and then added to the liquor in which the wood is placed. We have also particularly alluded to barwood as affording the coloring matter, but we in like manner use other suitable woods, particularly "red wood or red sanderswood and camwood." We would also observe, that although we have mentioned the per-sulphate of tin as affording the mordaunt or vehicle for the coloring matter, yet we do not confine ourselves thereto, for other salts of tin or of other metals, the per-sulphate of iron, for instance, may be used in lieu thereof, but the resulting color will of course vary, according to such alteration. The wood remaining in the vessel above described will be found to
312 be a colored material, and having been reduced by grinding or other means to fine particles, is applicable, according to the second part of our invention, as a pigment for general purposes; the foregoing description, therefore, combines two parts of our improvements, but, if desired, they may be used separately, that is to say, the operation may be conducted for one result only; and in reference to the pigment made from the wood itself, we do not limit ourselves to the methods described, as other processes may be

adopted for bringing out the tinctorial qualities of the wood. In obtaining a pigment from barwood for the purpose of printing paper hangings, we extract the coloring matter therefrom by treating it with alkaline solutions, as sodo, potash, or ammonia, or salts; those which we prefer are the carbonates, borates, and stannates of soda, potash, and ammonia; other salts, however, possessing an alkaline reaction may be used. In conducting this process we find that about one ounce to one ounce and a half of one of these dry salts to the gallon of water will afford a liquor of sufficient strength, using about six hundred gallons to half a ton of wood, and keeping it at the temperature of boiling water for about one hour. The coloring matter so extracted is then added to oxide of tin or other oxide or salt, according to the color required; and the pigment thus produced may be modified in consistence by the addition of foreign substances, as chalk, china clay, sulphate of barytes, &c.

Having thus described and ascertained the nature of our said invention, and the manner of carrying the same into effect, we desire it to be understood that we claim as secured to us under the above in part recited letters patent,—

Firstly, obtaining pigments from dye-woods by immersing them in a fluid containing a substance or substances which will take up dissolved coloring matter.

Secondly, the use of ground or similarly treated barwood as a pigment.

And, thirdly, the application of a pigment obtained from barwood, to the purpose of printing paper hangings.

In witness whereof, I, the said Thomas Roberts, have hereunto set my hand and seal, this fifteenth day of January, in the year of our Lord one thousand eight hundred and fifty-eight.

THOS. ROBERTS. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1858.

313 DEFENDANT'S EXHIBIT DALE AND CARO ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1860, 19th April. No. 985.

Specification of John Dale and Heinrich Caro.

Dyeing Yarns and Fabrics.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1860. Price 3*d*.

313*a* [British coat of arms.]

A. D. 1860, 19th April. No. 985.

Dyeing Yarns and Fabrics.

Letters patent to John Dale, of Manchester, in the county of Lancaster, manufacturing chemist, and Heinrich Caro, of the same place, chemist, for the invention of "improvements in dyeing cotton yarns or threads and fabrics."—A communication from abroad by Auguste Leonhardt, of Berlin.

Sealed the 17th October 1860, and dated the 19th April 1860.

Provisional specification left by the said John Dale and Heinrich Caro at the office of the commissioner of patents, with their petition, on the 19th April 1860.

We, John Dale, of Manchester, in the county of Lancaster, manufacturing chemist, and Heinrich Caro, of the same place, chemist, do hereby declare the nature of the said invention for "improvements in dyeing cotton yarns or threads and fabrics," to be as follows:—

Our invention consists in dyeing cotton yarns or threads and fabrics by treating them with a solution containing the necessary mordants and the coloring matter combined together, and subsequently with a substance which will precipitate the necessary material for constituting the dye, and we have found that the former of these may be kept in a fit state for use by the addition of gums or analogous organic materials and acids. The solution for the second treatment will necessarily be varied to suit the first and the color to be produced, and in this we employ alkalies or alkaline salts alone or with oxidizing materials.

313*b* Specification in pursuance of the conditions of the letters patent, filed by the said John Dale and Heinrich Caro in the Great Seal Patent Office on the 19th October 1860.

To all to whom those presents shall come, we, John Dale, of Manchester, in the county of Lancaster, manufacturing chemist, and Heinrich Caro, of the same place, chemist, send greeting:

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the nineteenth day of April, in the year of our Lord one thousand eight hundred and sixty, in the twenty-third year of her reign, did, for herself, her heirs and successors, give and grant unto us, the said John Dale and Heinrich Caro, her special license that we, the said John Dale and Heinrich Caro, our executors, administrators, and assigns, or such others as we, the said John Dale and Heinrich Caro, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in dyeing cotton

yarns or threads an- fabrics," upon the condition, amongst others, that we, the said John Dale and Heinrich Caro, or one of us, by an instrument in writing under our hands and seals, or under the hand and seal of one of us, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Heinrich Caro, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement (that is to say):—

This invention consists in dyeing cotton yarns or threads and fabrics by treating them with a solution containing the necessary mordaunts and the colouring matter combined together, and subsequently with a substance which will precipitate the necessary material for constituting the dye, and we have found that the former of these may be kept in a fit state for use by the addition of gums or analogous organic materials and acids. The solution for the second treatment will necessarily be varied to suit the first and the colour to be produced, and in this we employ alkalis or alkaline salts alone or with oxidizing materials.

313*c* In carrying out the invention we employ two different preparations, the nature of which we illustrate as follows:—

The colouring principles of logwood, fustic, bark, catechu, sapanwood, or shumach, either by themselves, or as mixtures of two or more of them, are dissolved in a suitable quantity of water, together with metallic salts or mordaunts, as salts of iron, alumina, tin, copper, &c., either alone or as mixtures of two or more of them, and we keep these mixtures of colouring matter and metallic salts in solution, or in a state fit for dyeing by combining them with gums, gum substitutes, sugar, or analogous organic matters, together with mineral or organic acids, and this constitutes our first preparation, through which the goods are passed in any usual manner most suitable to them, preferably an ordinary padding machine is employed. By whatever process this be done, it is essential that all excess of this first preparation be removed by squeezing or other means. This having been effected, we employ a second preparation, which has for its object the development and complete precipitation of the colour to be produced, and this second preparation consists of a solution of free alkali, as caustic soda, potash, amonia, or lime, or alkaline carbonates, phosphates, arseniates, acetates, tartrates, silicates, stannates, aluminates, together, when required (as in producing blanks), with oxidizing agents, as neutral or acid chromates of the alkalis.

By way of illustration we will now give certain substances and proportions we use, desiring it to be understood, however, that we do not confine ourselves thereto.

Black to Dye 10 *Lbs. of Cotton.*

First preparation.—Four gallons of logwood extract, 5° Tw., one gallon of fustic, 5° Tw., one pound of gum senegal, half a pound of molasses, dissolve and mix by degrees with six pounds of nitrate of iron, 42° Tw., previously mixed with three-quarter of a pound of oxalic acid, and half a pound of alum.

Second preparation.—One and a half gallon of neutral chromate of potash, of 7° Tw. The black is formed immediately in the goods, and after two or three hours they are ready for washing off.

Crimson for 10 *Lbs. of Cotton.*

First preparation.—Five gallons of extract of sapan, 2° Tw., one pound of gum senegal, half a pound of sugar, dissolve and mix with two pounds of alum half a pound of oxalic acid.

313*d* Second preparation.—One gallon and a half of neutral aluminate of potash, 1° Tw.

Blue for 10 *Lbs. of Cotton.*

First preparation.—Five gallons extract of logwood, 2° Tw., one pound of gum arabic, half a pound of sugar, dissolve and mix with two pounds of alum half a pound of oxalic acid.

Second preparation.—One gallon and a half of neutral aluminate of potash, 2° Tw., quarter pound of neutral chromate of soda.

Yellow for 10 *Lbs. of Cotton.*

First preparation.—Five gallons of bark liquor, 3° Tw., one pound of gum arabic, half pound of sugar, mix with two pounds of alum half a pound of oxalic acid.

Second preparation.—One and a half gallon of neutral aluminate of soda, 2° Tw.

Having thus described and ascertained the nature of the said invention, and the manner in which the same is to be performed, I desire it to be understood that we claim as secured to us under the above in part recited letters patent, the dyeing of cotton yarns or threads and fabrics by treating them firstly with a solution containing colouring matter and mordaunts combined, and subsequently with a solution which develops or precipitates the colour.

Also we claim the use of gums, sugars, or analogous organic matters and acids, or one of them in combination with the first preparation above described.

In witness whereof, I, the said Heinrich Caro, have hereunto set my hand and seal, the eighteenth day of October, in the year of our Lord one thousand eight hundred and sixty.

HEINRICH CARO. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1860.

314 DEFENDANTS' EXHIBIT JOHNSON ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1860, 18th July. No. 1744.

Specification of John Henry Johnson.

Coloring matter.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn, 1860.
Price, 4*d.*

314*a* [British coat of arms.]

A. D. 1860, 18th July. No. 1744.

Coloring Matter.

Letters patent to John Henry Johnson, of 47, Lincoln's Inn fields, in the county of Middlesex, and of 166, Buchanan street, in the city of Glasgow, North Britain, gentleman, for the invention of "a new coloring matter, and the means for obtaining the same." A communication from abroad by Louis Henry Obert, of 24, Rue Meslay, Paris, in the Empire of France.

Sealed the 28th December 1860, and dated the 18th July 1860.

Provisional specification left by the said John Henry Johnson at the office of the commissioners of patents, with his petition, on the 18th July 1860.

I, John Henry Johnson, of 47, Lincoln's Inn fields, in the county of Middlesex, and of 166, Buchanan street, in the city of Glasgow, North Britain, gentleman, do hereby declare the nature of the said invention of "a new coloring matter, and the means of obtaining the same," a communication from abroad by Louis Henry Obert, of 24, Rue Meslay, Paris, in the Empire of France, to be as follows:—

This invention relates to the production of a new coloring matter of a yellow tint obtained from vegetable substances, and which the inventor terms "panphiteic" acid.

314*b* This new acid is obtained by treating vegetable substances either in a divided state or a decoction, or infusion of the same with concentrated or diluted nitric acid, either alone or in conjunction with other mineral acids, such as sulphuric or hydrochloric acids. The injurious effects of the excess of the acids are mitigated by evaporation for a longer or shorter period, according as the "coloring matter" is required in a fluid or pasty condition, or in a crystalline form.

This acid coloring matter may be obtained from the roots of plants suitable for fodder, and from all liguminous plants, and more particularly from those of lucern, which contain a stiplic or astringent principle, and the decoction of which has no effect upon salts of iron. All plants containing this principle will produce the color required.

This coloring matter may also be obtained from the esparto, a decoction of which contains a yellowish coloring matter, and which upon the addition of prussiate of potash, assumes a blue tint.

All plants, or those whose decoctions having properties similar to the before mentioned, may be employed in the production of this new acid.

A decoction of the male flowers of the alder and of the hazel contain a coloring matter of a fawn color, which assumes a dark green color on the addition of salts of iron, such coloration being due to the presence of an astringent principle, or what I call tannin in these flowers; and, therefore, my invention is applicable to all vegetables which contain a tannin capable of producing other than a blue color when brought in contact with salts of iron, and which will produce a black color when mixed with logwood and salts of iron.

This new coloring acid may also be obtained from the female flower of the alder, the decoction of which contains a fawn-coloured coloring matter, and which assumes a blue color with salts of iron, and consequently my invention is equally applicable to the treatment of gall-nuts, sumac, and chestnut, and to all vegetables containing what I term "blue tannin."

The new acid may also be obtained from logwood, and from other dye-woods whose decoctions possess the same properties.

Substances colored yellow with the new coloring matter assume shades of grey when subjected to a bath of a decoction of logwood, with or without an alkali; these greys are slightly changed by acids, but again recover their tint when subjected to the action of alkalis. These tints when heightened by the action of sulphuric acid and alkalis assume various gradations of color.

314c Specification in pursuance of the conditions of the letters patent, filed by the said John Henry Johnson in the Great Seal Patent Office on the 18th January 1861.

To all to whom these presents shall come, I, John Henry Johnson, of 47, Lincoln's Inn fields, in the county of Middlesex, and of 166, Buchanan street, in the city of Glasgow, North Britain, gentleman, send greeting:

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the eighteenth day of July, in the year of our Lord one thousand eight hundred and sixty, in the twenty-fourth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said John Henry Johnson, her special license that I, the said John Henry Johnson, my executors, administrators, and assigns, or such others as I, the said John Henry Johnson, my

executors, administrators, or assigns, should at any time agree with, and no others, from time to time, and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "a new coloring matter, and the means for obtaining the same," a communication from abroad by Louis Henry Obert, of 24, Rue Meslay, Paris, in the Empire of France, upon the condition (amongst others) that I, the said John Henry Johnson, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said John Henry Johnson, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement (that is to say):—

The said invention relates to the production of a new coloring matter obtained from plants or vegetable substances of all kinds, and which new coloring matter the inventor calls panphiteic acid."

According to one method of carrying out this invention the plants from which this new acid is to be extracted are to be first treated in the manner described in the specification of a patent granted to Michael Henry on or about the 14th of June 1860 314*d* (No. 1454.) The decoctions resulting from such treatment are after being separated from the insoluble matter or pulp are to be placed in suitable vessels, to which decoctions nitric acid is to be added in proportion to the density or strength of the resulting decoctions. After the addition of nitric acid the solution is to be evaporated. The residuum so obtained will contain panphiteic acid, and this residuum may be diluted or dissolved in distilled or in acidulated water. Should it be desired to obtain panphiteic acid in a state of purity, the solution may be re-evaporated and redissolved until the acid is obtained of the desired condition. Instead of employing nitric acid as before mentioned, other acids and metallic or other salts may be mixed therewith.

In order to obtain panphiteic acid in a fluid condition, evaporation need only be carried to a degree sufficient to concentrate the solutions until the desired strength is obtained. The resinous, albuminous, or other bodies which are precipitated during the different processes produce also panphiteic acid when they are treated in the same manner as the decoctions, as do also the precipitates which are formed during the treatment of the plants, or during the concentration of the decoctions.

A more economical process consists in treating the decoctions according to the nature of the plants from which they are obtained with suitable acids or metallic salts, either in combination or singly, and in such proportions as will cause the resinous, albuminous, and other bodies to precipitate.

All other bodies possessing the property of promoting precipita-

tion in such solutions may be employed. The precipitates are collected on filters, and are treated with hot or cold nitric acid, the precipitates being either in a moist or in a dry state, pulverized, or otherwise. The quantity of acid to be employed is in proportion to the state of dryness of the precipitates. According to the nature of the precipitates, and the colors or shades it is desired to obtain, I add to the nitric acid such other acid or metallic salts as will complete the process.

The same process is followed in manufacturing panphiteic acid from all kinds of resins, gums, wax, in fact from all vegetable exudations.

The substances above referred to are to be dissolved in suitable solvents, which may be alcohol, ether, ammonia, or bisulphuret of carbon; when the solution has been effected it is submitted to the action of nitric acid alone, or with such additions as are hereinbefore mentioned. On having first submitted the hereinbefore-mentioned substances to the said action of nitric acid, I then exhaust them by means of alcohol, ether, ammonia, bisulphuret of carbon, or any other solvent.

When panphiteic acid is thus obtained it may be purified by repeated solution and evaporation according to the degree of
314*e* purity desired. When the before-mentioned decoctions are separated from their precipitates they may be treated in the same manner as the precipitate itself is operated upon. By concentrating the decoctions, and with the addition of alkalis or of alkaline salts to such of them as do not contain a sufficient quantity thereof, and by treating them in the manner above described with acids and metallic salts, I obtain a very pure mordant, which may be advantageously substituted for all those mordants hitherto used by dyers in the dyeing of animal substances.

The mordants of iron may be combined with these before-mentioned mordants for those textile fabrics for which mordants of iron are now used. Panphiteic acid may also be used as a mordant, as it also produces a yellow dye without the aid of any agent, and can be substituted for a mordant whenever a yellow ground is required.

When panphiteic acid is obtained from catechu, or plants similar to catechu, its colors vegetable substances yellow without the employment of any mordant. Different colors may be obtained by combining panphiteic acid with other coloring matters, and by the processes herein indicated a light-green color may be obtained.

In order to obtain a light-green color equal quantities of prussiate of potash and panphiteic acid are to be dissolved, either together or separately, and subsequently mixed. It is optional in making this mixture whether panphiteic acid or picric acid, or even both mixed together, be employed.

The solution must be more or less diluted, and silks or woollens acquire a clear light-green dye by simply dipping them in this acidulated bath without the addition of any salts of iron. The simple addition of a sufficient quantity of nitric or hydrochloric, or other acid, suffices in order to obtain those clear tints.

Panphiteic acid obtained from catechu and other similar products when treated as above, dyes vegetable fibres green.

In order to obtain all the shades of dark green, I first immerse the fabrics to be dyed in a bath containing salts of nitrate of iron. In order to prevent the baths composed of the salts of iron from staining or spotting the fabrics to be dyed, a very small quantity of sulphuric, muriatic, or other acid may be added. These baths may be used either hot or cold, according to the nature of the fabric to be dyed. It is evident that all yellow coloring matter which will combine with the prussiate of potash will produce the same green dye. The relative quantities of the different bodies which are mixed together may vary "*ad infinitum*" according to the tint of green required.

Fabrics which have been dyed yellow by means of this new acid may be made to assume all shades of grey by employing a bath of logwood, with or without the addition of an alkali. Acids
314*f* cause these greys to fade slightly, but alkalis restore them to their original tint; by being subjected to the repeated action of sulphuric acid and of alkalis these yellow tints may be heightened several shades.

Having now described and particularly ascertained the nature of the said invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion, that what I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore in part recited letters patent is,—

First, the application and use to and in the dy-ing of fibrous substances of the hereinbefore-described coloring matter, which I term "panphiteic acid."

Second, the peculiar processes for obtaining the coloring matter, which I term "panphiteic" acid" from plants and vegetable substances generally, as hereinbefore described.

In witness whereof, I, the said John Henry Johnson, have hereunto set my hand and seal, this eighteenth day of January, one thousand eight hundred and sixty-one.

J. HENRY JOHNSON. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1860.

315 DEFENDANTS' EXHIBIT SCHULTZ ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1861, 2nd December. No. 3021.

Specification of Alexander Schultz.

Colours for printing and dyeing.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1862.
Price, 3*d.*

315*m* [British coat of arms.]

A. D. 1861, 2nd December. No. 3021.

Colours for Printing and Dyeing.

(This invention received provisional protection only.)

Provisional specification left by Alexander Schultz at the office of the commissioners of patents, with his petition, on the 2nd December, 1861.

I, Alexander Schultz, of Paris, in the empire of France, manufacturing chemist, do hereby declare the nature of the said invention for "improvements in the manufacture of certain colours for printing and dyeing fabrics," to be as follows:

The nature of my invention consists in the employment of a decoction of logwood, combined with caustic soda, for producing different shades of black, chocolate, olive, and other colours upon cotton, wool, silk, and other fabrics, or upon fabrics made of a combination of cotton, wool, silk, and other fibres.

The mordant which I employ for fixing the colours prepared by combining logwood and caustic soda, consists of a mixture of acetate of lead and acetate of tin; but alum and the stannate of soda, or the various salts of tin may be employed. It is evident that the shades of colours to be produced may be varied by adding to the combined decoction of logwood and caustic soda other dye materials now known and in use.

London: Printed by George Edward Eyre and William Spotiswoode, printers to the Queen's most excellent majesty. 1862.

316 DEFENDANTS' EXHIBIT MAYALL ENGLISH PATENT, MAY 22. 1888.

[British coat of arms.]

A. D. 1862, 9th May. No. 1392.

Specification of Francis Frederick Burdett Mayall.

Dyeing.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1862.
Price, 4*d*.

316*a* [British coat of arms.]

A. D. 1862, 9th May. No. 1392.

Dyeing.

(This invention received provisional protection only.)

Provisional specification left by Francis Frederick Burdett Mayall at the office of the commissioners of patents, with his petition, on the 9th of May, 1862.

I, Francis Frederick Burdett Mayall, of Warrington, in the county of Lancaster, dyer, do hereby declare the nature of the said invention for "improvements in dyeing mixed or plain fabrics and yarns," to be as follows:—

I dye mixed fabrics or yarns, such as a mixture of silk, cotton, woollen, worsted, and linen at one operation, either black, drab, claret, brown, olive, or other color, in not more than one to three vats, as may be required; or I dye fabrics made of any one of the said materials separately in the same way. For this purpose, instead of using a number of vats, and consequently a number of separate processes as at present adopted, I never exceed three, and in all ordinary cases only two. For example, in dyeing either mixed or plain fabrics black in No. 1 vat, I use chipped or ground logwood, brown sugar of lead, manganese, and ammonia of copper, with a little fustic chipped or ground. The heat of the water and the proportions of the different materials must vary according to the substances of the articles to be dyed. No. 2 vat, which is a finishing or cleaning process, is composed of a solution of neutral chromate of potash, and bichromate of potash added, if necessary, or, for some shades, a little ammonia or sulphur of iron.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1862.

317 DEFENDANTS' EXHIBIT GREEN ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1863, 29th May. No. 1354.

Specification of William Green.

Black coloring matters or pigments.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1863.
Price, 4*d.*

317*a* [British coat of arms.]

A. D. 1863, 29th May. No. 1354.

Black Coloring Matters or Pigments.

Letters patent to William Green, of Margaret's Place, Old Ford road, in the county of Middlesex, for the invention of "improvements in the means or method of producing black coloring matters or pigments."

Sealed the 24th November 1863, and dated the 29th May 1863.

Provisional specification left by the said William Green at the office of the commissioners of patents, with his petition, on the 29th May 1863.

I, William Green, of Margaret's Place, Old Ford road, in the county of Middlesex, do hereby declare the nature of the said invention for "improvements in the means or method of producing black coloring matters or pigments," to be as follows:—

According to the present processes of manufacturing black coloring matters or pigments the black is generally obtained as a carbonaceous product, the result of combustion or burning of coal tar, various oils, and other similar matters, whereby the various smokes or lampblacks are produced, and which are suitable for the purposes of paint, printing inks, and such like.

Now my invention consists of the manufacture of black pigments from such materials as are now used in dyeing and in making black writing ink, such as logwood, galls, tannin, in combination with the mordants now in use for such purposes, and in the
317*b* application of such new pigments to the purposes for which the before-mentioned smoke, vegetable, and such like blacks are used; and I also propose to use these black pigments in combination with the blacks of commerce.

My mode of proceeding is to precipitate the coloring matter in

conjunction with the mordants, and to filter and dry in the manner usual in making other precipitated colors, such as lakes and Prussian blues. The ingredients I mostly use are logwood, galls, and tannin, the salts of iron, copper, and such chemicals as are known in the dyeing trade to strike a black with such ingredients. And I also prepare these precipitates as water colors, in which case they are only partially dried.

Specification in pursuance of the conditions of the letters patent, filed by the said William Green in the Great Seal Patent Office on the 28th November 1863.

To all to whom these presents shall come, I, William Green, of Margaret's Place, Old Ford road, in the county of Middlesex, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twenty-ninth day of May, in the year of our Lord one thousand eight hundred and sixty-three, in the twenty-sixth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said William Green, her special licence that I, the said William Green, my executors, administrators, and assigns, or such others as I, the said William Green, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in the means or method of producing black coloring matters or pigments," upon the condition (amongst others) that I, the said William Green, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said William Green, do hereby declare the nature of my said invention, and in what manner the
317c same is to be performed, to be particularly described and ascertained in and by the following statement:—

According to the present methods of producing black coloring matters or pigments they are obtained as carbonaceous compounds, the result of the combustion or burning of tar, various oils, and other similar matters, whereby various smoke or lampblacks are produced; others are obtained, as charcoal, by the calcination of numerous substances, such as ivory, vine twigs, &c.; these constitute the only processes now in use for the manufacture of blacks, and they are all essentially of a dark brown or olive color; in fact, they may be described as little more than browns or olives multiplied, but such blacks are found suitable for the purposes of printing ink, paint, &c.

The object of my invention is to produce blue or jet blacks by more strictly chemical means, which I do by the use of such materials as are used in the manufacture of black writing inks and in dyeing blacks, such as myrabolanes, galls, logwood, and the various tanning matters; and my mode of proceeding is by the precipitation of the coloring matters of the said materials in conjunction with those chemicals or mordants that are known to strike a black therewith, and which precipitates I wash and dry after filtering in precisely the manner adopted in making precipitated colors generally, such as lakes or Prussian blue, which I will further describe as follows:—I first make the extract or solution by boiling the coloring matters; this I put into a vessel and allow to stand until quite clear; the mordant to be used is also, when a soluble one, dissolved in water and left to clear itself; the two are then drawn off and mixed in another vessel; when the color has subsided the mother liquor is drawn off, which is replaced by clean water; the color is allowed again to subside, and the liquor is drawn off as before, and this process repeated if necessary; the color is then placed on filters, and allowed to drain; it is then removed to the drying or heated room, where all remaining moisture is driven off, in which state it is ready for use, or it may be crushed or ground into powder, sifted, and so produced in the shape of dust. I also prepare these precipitates as water colors, in which case they are only partially dried, or they may be mixed in their damp state with size or other suitable vehicle, and dried for use as crayons, or as solid ink in lieu of black lead. There are some of the materials that may for cheapness be simply mixed with the mordant and dried, such as solid extract of logwood, cutch, &c. As most of these pigments, if precipitated with their mordants only, would, when dried, be hard and difficult to grind, in order to render them commercially useful, I generally precipitate on what is termed a basis, such as china clay or carbonate of lead; or for this purpose, such basis may be used as will 317*d* of itself form a black with logwood, gallic acid, or tannin, as, for instance, some of the insoluble salts of the metals, as chromate of lead or carbonate of copper; and such basis may be first stained by being boiled in an extract of the coloring matter, in which state they may sometimes be used as cheap pigments when washed and dried, or such chemicals may be used as do of themselves deposit a soft basis, for instance, sulphate of copper and logwood give a deep blue black, if an alkali or some of the salts of the alkalis be added thereto, the copper will be precipitated as a carbonate combined with the coloring of the wood, and so act as basis and mordant; and I may here mention that I sometimes use the blacks of commerce as a base on which to precipitate these new pigments. For some uses these precipitates may be, when partially dried, mixed with the oil, and then heated to drive off the remaining moisture. I sometimes mix two or more of the dyestuffs together, as logwood with galls, as I do also sometimes use more than one mordant, such as sulphate of iron, with some of the salts of lead or potash, by which the precipitates may be varied in tone of color and texture of body to suit the purpose for which they are to be used. When using

galls or materials containing gallic acid, I prefer to add an alkali; or an alkaline earth may be added after the copperas or other mordant, so as to cause the more perfect precipitation of the color.

There are other chemicals than those instanced herein that are known to strike a black with some of the before-mentioned dyestuffs, such as some of the salts of lead and bichromate of potash with logwood, which may be used in the production of these pigments. In cases where the affinity of the coloring matter for its mordant is low, I sometimes raise the solutions to a boiling heat, to accelerate the combination, as with many of the tanning matters.

I cannot herein give any set proportions, as the materials vary in quality; it is known, for instance, that galls will take from one-quarter to half their weight of copperas, and this must be used at the discretion of the workman; but this is not of material importance, as by the process of washing the precipitate, as heretofore described, any excess of either mordant or coloring matter is removed. But after the foregoing general description of my invention, I will give the three following examples, one a method of using logwood, one of cutch or tanning matter, and one of galls or matters containing gallic acid; and I will vary these processes so as to make them explanatory as possible of my invention, and along with one or other of these three materials may be classified nearly the whole of the coloring matters I propose to use.

317*e* Before giving the said examples I will remark, that as nearly the whole of these blacks are precipitated by a metallic mordant, I intend in commerce to style them patent metallic blacks.

I will now give the following as one of my methods of using logwood:—I take a clarified extract thereof containing one pound to every gallon, which should be of the strength of one degree by Twaddle's hydrometer, to each gallon of which I will mix four ounces of china clay or other base; I then add at the rate of a quarter of a pound of copperas to each gallon, which I use in a clarified solution, as described in the first part of this specification. I then allow the precipitate to subside, wash, and dry, as also hereinbefore described.

The following may be taken as a method of using cutch or tanning matters:—I take a clear solution of free cutch containing half a pound to the gallon or of five degrees on the hydrometer; to this I put two ounces of pearl ash, and afterwards four fluid ounces of nitrate of iron to each gallon; I then boil in another vessel a given weight of the base for the purpose of staining it. And I will here select chromate of lead, for example, to each pound of which I add six gallons of extract of logwood containing one pound to the gallon; this I boil a short time. I then mix at the rate of one pound of the stained base to each pound of cutch, raise the mixture to its boiling point, and then pass it through a very fine sieve into the stand tubs, when the color is allowed to settle, and is washed and dried, as before stated.

And, lastly, in using galls, the following method may be adopted:—Put any given weight of carbonate of copper as a base

into a boiler: to each pound of this add one gallon of logwood or the extract from one pound. Raise this to one hundred degrees of heat; then add to each pound of copper under operation three gallons of a clear infusion of galls of five degrees of strength by the hydrometer. To every gallon of this mixture put three fluid ounces of nitrate of iron, and pass the whole through a fine sieve into the stand tubs; allow the color to precipitate, wash and dry in the manner before stated; or in lieu of carbonate a sulphate or other soluble salt of copper may be used, in which case an alkali or alkaline agent should be added so as to precipitate the copper as a carbonate after its combination with the coloring matter.

I have in each of these three instances used a base, because I believe it is mostly best to do so; but I wish it to be understood that I do not confine myself to the so doing, as there are some of these precipitates that do not for all purposes require it; but what I claim as my invention is,—

Firstly, the production of black pigments by the precipitation of the coloring matter of myrabolanes, galls, logwood, tannin, and such other materials as are used in the manufacture of black writ-
317*f* ing inks and in dyeing black in conjunction with the mordants that are used for such purpose, and the application of such pigments, when dried, to the purposes for which smoke, vegetable and such blacks are capable of being used either alone or in admixture with the blacks of commerce.

Secondly, the precipitation of the said black pigments upon or in conjunction with a basis, as before described, for the production of soft blacks, and the use of the base when simply stained with these coloring matters as a black pigment.

Thirdly, the use of the before-mentioned pigments as water colors, or dried as described herein as crayons or solid ink.

In witness whereof, I, the said William Green, have hereunto set my hand and seal, this twenty-third day of November, in the year of our Lord one thousand eight hundred and sixty-three.

W. GREEN. [L. S.]

Witness,
ALEX. PRINCE,
Office for patents, 4, Trafalgar square, Charing Cross.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent Majesty. 1863.

318 DEFENDANTS' EXHIBIT BROOMAN'S ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1863, 1st August. No. 1902.

Specification of Richard Archibald Brooman.

Dyeing mixed fibres.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1864.
Price, 4*d*.

318*a* [British coat of arms.]

A. D. 1863, 1st August. No. 1902.

Dyeing Mixed Fibres.

Letters patent to Richard Archibald Brooman, of 166, Fleet street, in the city of London, patent agent, for the invention of "improvements in dyeing mixed animal and vegetable fibres whether in a raw or manufactured state."—A communication from abroad by Theophile Grison, of Deville-les-Rouen, France.

Sealed the 29th January 1864, and dated the 1st August 1863.

Provisional specification left by the said Richard Archibald Brooman at the office of the commissioners of patents, with his petition, on the 1st August 1863.

I, Richard Archibald Brooman, of 166, Fleet street, in the city of London, patent agent, do hereby declare the nature of the said invention for "improvements in dyeing mixed animal and vegetable fibres, whether in a raw or manufactured state," to be as follows:—

By the processes hitherto employed for dyeing mixed animal and vegetable fibres and tissues, it has been necessary to submit the fibres or tissues to two separate dyeings, one to dye the animal and the other the vegetable fibres. This invention consists in dyeing mixed animal and vegetable fibres, whether in a raw, carded, combed, spun, or manufactured state, at one operation as hereafter described. I will first describe the process for dyeing cloth black.

Preparation for mordanting:—This preparation may be performed in two different ways; the first consists in carrying on the
318*b* operation of mordanting and dyeing in a single bath, and the second in two distinct baths. According to the first method if I wish to dye a piece of mixed cloth weighing from, say, 20 to 25 lbs. of wool, I prepare a bath of water in a trough or in an ordinary vessel for dyeing black, and I place therein from 1 to 4½

lbs. of sulphate of iron, and from a half to 2¼ lbs. of sulphate of copper. Other salts of iron and copper may be substituted for those mentioned, or even soluble salts of zinc, lead, manganese, or chromium, singly or mixed in various proportions.

The proportions of the ingredients above mentioned are for different shades of black. I place the stuffs to be dyed in the bath thus prepared, work them therein, and boil for about an hour. I then take out the cloth on a roller and add to the bath sufficient alkali to neutralize the acid contained therein; I also add from 1 to 2¼ lbs. of of shumac, 1 to 2¼ lbs. of fustic, and from 9 to 13¼ lbs. of logwood (or extract of these woods), according to the shade I wish to obtain; I then heat the bath to from 100° to 120° Fahrenheit, and work the cloth therein for 15 or 20 minutes; I afterwards raise the bath to boiling point for an hour or an hour and a half. If it is desired to heighten the color I add at the middle of this last operation from 3½ to 8 ounces of the salt before supplied to the bath. These proportions vary according as it is desired to obtain deeper or lighter shades.

According to the second method I operate in two baths. I first prepare a bath of a salt of iron, hot or cold, with one of the salts above named, or with acetate, nitrate, pyrolignite, or chloride of iron, alone or mixed with soluble salts of copper, chromium, manganese, or lead; this bath may vary from 1° to 8° Beaumé, according to the shade to be obtained; I place the stuffs to be dyed in the bath thus prepared, and when they have become sufficiently impregnated and saturated with the liquid I take them out and leave them for from 6 to 12 hours. When I operate hot I place the stuffs in the bath at a temperature of from 130° to 150° Fahrenheit for 2 hours, and afterwards rinse them with a stream of water before dyeing them; I prepare the dyeing bath in a trough or other suitable vessel and supply it with the quantities of coloring matter mentioned as used in the first method. I heat the bath to from 100° to 120° Fahrenheit, and place the stuffs therein for 15 or 20 minutes. I then raise the heat to boiling point; after boiling for an hour I take out the stuffs and add to the bath a small quantity of one or several of the salts mentioned; I then again boil for an hour. The mixed animal and vegetable fibres are now perfectly dyed. For other colors I operate in the same manner as for black, the mordants and the coloring matters alone differing. The mordants employed are the salts with a base of alumnia and those with a base of tin, or both mixed in varying proportions. All these mordants are well known; what I consider as new are the combination and the mode of employment which allows of their being simultaneously applied to animal and vegetable fibres. I prepare a bath of one of these mordants at from 1° to 10° Beaumé, according to the shade to be obtained, and I work hot or cold to perform the operation more or less quickly. After the mixed fibres have been well saturated in this bath I place them in another bath slightly alkaline, and without washing being necessary, I dye them as before described for dyeing black. By this means I precipitate on the fibres the quantities of bases necessary for the uniform dyeing.

318c

Specification in pursuance of the conditions of the letters patent, filed by the said Richard Archibald Brooman in the Great Seal Patent Office on the 1st February 1864.

To all to whom these presents shall come, I, Richard Archibald Brooman, of 166, Fleet street, in the city of London, patent agent, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the first day of August, in the year of our Lord one thousand eight hundred and sixty-three, in the twenty-seventh year of her reign did, for herself, her heirs and successors, give and grant unto me, the said Richard Archibald Brooman, her special licence that I, the said Richard Archibald Brooman, my executors, administrators, and assigns, or such others as I, the said Richard Archibald Brooman, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in dying mixed animal and vegetable fibres, whether in a raw or manufactured state," (communicated to me from abroad by Théophile Grison, of Deville-les-Rouen, France,) upon the condition (amongst others) that I, the said Richard Archibald Brooman, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

318*d* Now know ye, that I, the said Richard Archibald Brooman, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

By the processes hitherto employed for dying mixed animal and vegetable fibres and tissues it has been necessary to submit the fibres or tissues to two separate dyeings, one to dye the animal and the other the vegetable fibres. This invention consists in dyeing mixed animal and vegetable fibres, whether in a raw, carded, combed, spun, or manufactured state, at one operation, as hereafter described. I will first describe the process for dyeing cloth black.

Preparation for mordanting:—This preparation may be performed in two different ways; the first consists in carrying on the operation of mordanting and dyeing in a single bath, and the second in two distinct baths. According to the first method if I wish to dye a piece of mixed cloth weighing from 20 to 25 lbs. of wool, I prepare a bath of water in a trough or in an ordinary vessel for dyeing black, and I place therein from 1 to 4½ lbs. of sulphate of iron, and from a half to 2¼ lbs. of sulphate of copper. Other salts of iron and of copper may be substituted for those mentioned, or

even soluble salts of zinc, lead, manganese, or chromium, singly or mixed in various proportions.

The proportions of the ingredients above mentioned are for different shades of black. I place the stuffs to be dyed in the bath thus prepared, work them therein and boil for about an hour; I then take out the cloth on a roller and add to the bath sufficient alkali to neutralize the acid contained therein; I also add from 1 to 2¼ lbs. of shumac, 1 to 2¼ lbs. of fustic, and from 9 to 13¼ lbs. of logwood (or extracts of these woods), according to the shade I wish to obtain. I then heat the bath to from 100° to 120° Fahrenheit, and work the cloth therein for 15 or 20 minutes; I afterwards raise the bath to boiling point for an hour or an hour and a half. If it is desired to heighten the color, I add at the middle of this last operation from 3½ to 8 ounces of the salt before supplied to the bath. These proportions vary according as it is desired to obtain deeper or lighter shades.

According to the second method I operate in two baths. I first prepare a bath of a salt of iron, hot or cold, with one of the salts above named, or with acetate, nitrate, pyrolignite, or chloride of iron, alone or mixed with soluble salts of copper, chromium, manganese, lead; this bath may vary from 1 to 8 Beaumé, according to the shade to be obtained. I place the stuffs to be dyed in the bath thus prepared, and when they have become sufficiently impregnated and saturated with the liquid, I take them out and
318e leave them for from 6 to 12 hours. When I operate hot I place the stuffs in the bath at a temperature of from 130° to 150° Fahrenheit for two hours, and afterwards rinse them with a stream of water before dyeing them. I prepare the dyeing bath in a trough or other suitable vessel, and supply it with the quantities of coloring matter, mentioned as used in the first method. I heat the bath to from 100 to 120° Fahrenheit, and place the stuffs therein for 15 or 20 minutes; I then raise the heat to boiling point. After boiling for an hour I take out the stuffs and add to the bath a small quantity of one or several of the salts mentioned; I then again boil for an hour. The mixed animal and vegetable fibres are now perfectly dyed. For other colors I operate in the same manner as for black, the mordants and the coloring matters alone differing. The mordants employed are the salts with a base of alumina, and those with a base of tin, or both mixed in varying proportions. All these mordants are well known; what I consider as new are the combination and the mode of employment which allows of their being simultaneously applied to animal and vegetable fibres. I prepare a bath of one of these mordants at from 1° to 10° Beaumé, according to the shade to be obtained, and I work hot or cold to perform the operation more or less quickly. After the mixed fibres have been well saturated in this bath, I place them in another bath slightly alkaline and without washing being necessary, I dye them as before described for dyeing black. By this means I precipitate on the fibres the quantities of bases necessary for their uniform dyeing.

And having now described the nature of the said invention, and in what manner the same is to be performed, I declare that I claim

dyeing mixed animal and vegetable fibres, whether in a raw or manufactured state, at one operation, substantially by the means and in manner hereinbefore described.

In witness whereof, I, the said Richard Archibald Brooman, have hereunto set my hand and seal, this first day of February one thousand eight hundred and sixty-four.

R. A. BROOMAN. (L. S.)

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1864.

319 DEFENDANTS' EXHIBIT HENRY ENGLISH PATENT, MAY 22, 1888.

[British coat of arms.]

A. D. 1864, 23rd September. No. 2336.

Specification of Michael Henry.

Dyeing and tanning.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1865.

Price, 6*d*.

319*a* [British coat of arms.]

A. D. 1864, 23rd September. No. 2336.

Dyeing and Tanning.

Letters patent to Michael Henry, of 84, Fleet street, in the city of London, patent-agent, for the invention of "improvements in dyeing and tanning, and in preparing for dyeing and printing."—A communication from abroad by Flavie Victorine Augustine Autier, of 33, Boulevart Saint Martin, Paris, France.

Sealed the 17th March 1865, and dated the 23rd September 1864.

Provisional specification left by the said Michael Henry at the office of the commissioners of patents, with his petition, on the 23rd September 1864.

I, Michael Henry, of 84, Fleet street, in the city of London, patent agent, do hereby declare the nature of the said invention for "improvements in dyeing and tanning, and in preparing for dyeing and printing," communicated to me from abroad by Flavie Victorine Augustine Autier, of 33, Boulevart Saint Martin, Paris, France, to be as follows:—

This invention relates partly to fixing tannins used with dyestuffs or coloring matters and with mordants. The liquors may be hot or cold. The main improvements comprise the use of general

mordants, mordanting and dyeing in one bath, using the wood of oak and the tannin of such wood in dyeing, tanning, and preparing for dyeing; also dyeing wood and other fabrics cold without cream of tartar; dyeing by oak and oak tannin (tannin of the wood of oak), employing oak and other tannins instead of sumach to prevent the coppery tint of logwood and for other purposes, combining oak and logwood for dyeing black, using oak instead of sumach for fancy colours; using flowers and fruit of alder instead of
319½ dyer's weed; using nut-tree leaves; using oak for producing novel tints; and employing the wood of oak and tannin of the wood of oak for tanning. Mordants, especially for dyeing woollen goods black, may be composed of nitric and hydrochloric acid, to which may be added powdered sulphate of iron or sulphates or other salts of zinc, copper, alumina, tin, chromium, lead, or other agents (to saturation or not); acetates, chlorides, or nitrates of iron or other salts may be used as mordants generally. The mordants may first be placed in a cold liquor, which is afterwards heated; the mordants left in the bath is neutralized by a solution of powdered carbonate of lime or otherwise, a decoction of alder fruit or flowers, sumach, or oak bark or other coloring or tanning matters are added after working the goods about: also logwood or other dyestuff, and the process finished as usual. Dyeing and mordanting may be performed in one bath, or the materials may be removed from the mordant bath, washed, and finished as usual. Fast logwood blacks may be obtained by using sulphate of iron after the dye bath or otherwise. When alder or gall-nut is used, the operation should be concluded with brown sulphate or pyrolignite of iron. A little carbonate of lime may be employed with the logwood. Woollen goods may be died cold thus, after cleansing with salts of soda or potassa or other salts they are treated with chloride in solution, preferring chloride of lime as used in bleaching cottons dyed in light colors. A light cold bleach adapts goods for receiving colours; foreign matters mixed with wool may be died by general mordants added to the acid bath which follows the chlorine bath, but best added when the goods are taken out of the chloride liquor. Wool may be mordanted without being washed, the mordants not being introduced into the acid bath. Dyestuffs, chlorine, or other agents may be forced into the goods by rollers or otherwise. Chloride solutions may be used for preparing woolen or other goods for being dyed and printed, whereby cream of tartar may be dispensed with. Silk, hair, bristles, and feathers may be prepared for dyeing or printing by metallic, alkaline, or other chlorides or hydrochlorides, especially after the chlorine liquor. To remove the coppery tint which logwood communicates, and to bring out the blue-black tint below, goods before being finished should be treated with a decoction of one of the mordants of oak or other of the numerous known tannins except sumach, but preferring old red odorous mountain oak, and especially the part next the soil. It may be used in the operation of giving the preparatory blue or half-black dye, or for being mixed with logwood or other dyestuffs afterwards. Sulphate of zinc, pure or mixed with sulphate of iron or copper, may be used with

logwood to get a rich black. Oak or the tannin of the wood of oak or other tannins other than sumach may be used in solution; the goods should be worked about and allowed to
319c rest after being taken from the bath, then washed and passed through cold sulphate of iron. The gall bath may be repeated. The last liquor used may be brownish sulphate of iron with or without a little pyrolignite of iron; or the galling may be concluded with logwood by ordinary processes, and brownish sulphate of iron with or without ordinary sulphate of iron and copper, "finishing" with oak in solution. For dyeing cotton velvets and other goods brownish sulphate of iron, mixed or not with ordinary sulphate of iron, may be used after the velvet is half dyed by tannin or logwood; in one case brownish sulphate and in the other ordinary sulphate of iron may be used; for "finishing" logwood and brown sulphate of iron are used, with or without sulphate of copper, green and brown sulphates of iron, combined or separately, may be employed. The wood of oak or the tannin thereof may be used instead of sumach for dyeing velvet and other fabrics, and various fancy and other shades may be thereby obtained according to the mordant used. Alder fruits and flowers may be used with chesnut and nut-tree leaves as a substitute for dyer's weed. Alder fruits and flowers, oak and other matters containing tannin may be used with salts of iron for tanning. The wood of oak in a state of powder or sawdust or of shreds may be employed instead of oak bark, though a little bark may be added. The same oak is recommended as for dyeing, preferring the wood next the bark.

Specification in pursuance of the conditions of the letters patent, filed by the said Michael Henry in the Great Seal Patent Office on the 23rd March, 1865.

To all to whom these presents shall come, I, Michael Henry, of 84, Fleet street, in the city of London, patent agent, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twenty-third day of September, in the year of our Lord one thousand eight hundred and sixty-four, in the twenty-eighth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Michael Henry, her special licence that I, the said Michael Henry, my executors, administrators, and assigns, or such others as I, the said Michael Henry, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an inven-
319d tion for "improvements in dyeing and tanning, and in preparing for dyeing and printing," communicated to me from abroad by Flavie Victorine Augustine Autier, of 33, Boulevart Saint Martin, Paris, France, upon the condition (amongst others) that I, the said Michael Henry, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and

seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Michael Henry, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, thereof, that is to say :—

This invention relates partly to fixing tannins used with dyestuffs or coloring matters, and with mordants. The liquors may be hot or cold. The main improvements comprise the use of general mordants; mordanting and dyeing in one bath, using wood of oak, or the tannin of such wood in dyeing, tanning, and preparing for dyeing; dyeing wool and other fabrics cold, without cream of tartar; employing oak and other tannins instead of sumach to avoid the coppery tint of logwood, and for other purposes; combining oak and logwood in dyeing black; using oak instead of sumach for fancy colors; using flowers and fruits of alder instead of dyer's weed; using nut-tree leaves; using oak (wood) tannin for producing novel tints, and employing tannin of the wood of oak for tanning.

The expression "general mordant" used in this specification signifies a mordant which is fixed at the same time on all the fibrous or textile matters contained in a fabric or material.

Preparation of mordants.—Wools and woollen goods or fabrics may be dyed in all shades by means of the mordants about to be described, whatever the nature, quantity, or quality of the extraneous matters incorporated intentionally or otherwise with the wool. The following formula for a mordant for black and its varieties will serve as an example or type for mordants for other colors.

Nitric acid at 36° Beaumé	11 lbs.
Hydrochloric acid at 21° Beaumé	11 lbs.

Mix these together, and then add 44 lbs. powdered sulphate of iron, a little at a time, so that the mordant may be finished in two hours; the mordant may be rendered more acid and will be better preserved in the liquor if only about 33 lbs. of the
319c sulphate be used. The shade of color may be varied by adding to the sulphate of iron one or two lbs. of one of the following salts; sulphate of zinc, sulphate of copper, sulphate or other salts of alumina, sulphates or other salts of tin, chromium, or lead, or other salts ordinarily employed for producing any particular color, selecting the salt or agent according to the color required, and employing it if desired to saturation. For example, sulphate of iron would be used for blue and blue blacks, double sulphate of alumina or potassa for violet and grey; sulphate of tin for violet, garnet, and scarlet; sulphate of lead for blue; sulphate of zinc for dark violet and chestnut. Acetates, chlorides, nitrates, or other

salts of iron or of the above-named matters, called by the inventor energetic mordants, may be used as general mordants.

Mordanting and dyeing wool by a warm process.—A dyeing liquor or bath is prepared, say, for example, for black of a specific gravity of $\frac{1}{10}$ to $\frac{3}{10}$ of a degree of the areometer at most, and while the liquor is cold the goods are worked about in it for about ten minutes. It is then heated up to about 122° Fahrenheit in ten minutes, it is kept at this temperature for twenty minutes, but not longer. If the operation be properly conducted the liquor will keep clear. When the goods are taken from the liquor the mordant which remains in it is neutralized preferably by adding to every 44 gallons of water a solution of 4 oz. of powdered carbonate of lime, left to settle for about five minutes. Next is added a solution of about one to 2 lbs. of alder fruits, sumach, gall-nut, oak bark, or other coloring or tanniferous matter of a nature not inconsistent with the agent used for producing the required color. The goods are worked about for about ten minutes, and then ordinary quantities of solution of logwood or other coloring agent are introduced to finish the operation as usual. The dyeing may thus be performed in a single bath, and completed in less than two hours, or if preferred the goods may be removed from the mordant bath, and washed and finished by the usual processes. Blacks produced by logwood may be rendered fast colours by subjecting them after the dye liquors to a third bath composed of sulphate of iron, selecting that which will yield the deepest black ; this sulphate of iron may even be added to the coloring liquor after the goods have been treated therein. When the dyestuff used is alder, gall-nut, gall, or other tannins, the operation is always to be finished off with iron, using for the purpose a brownish sulphate or pyrolignite of iron in a proportion of about 2 lbs. 3 oz. to 44 gallons water. The mordant bath may be cold, but in that case its specific gravity should be about 3°, and the goods kept in it for an hour. The action of the logwood my be accelerated and improved by adding to every 220 gallons of the liquor (*i. e.* log-
319*f* wood solution of 1 lb. 1½ oz. logwood in 9 quarts water) a solution in a somewhat subsided state of 1 lb. 1½ oz. of powdered carbonate of lime.

Mordanting and dyeing wool by a cold process.—Woollen yarn, thread, and fabrics whether mixed or not with other fibrous or textile substances may be wholly dyed by cold liquors ; thus the grease is first removed from the materials by alkaline salts as usual, they are then subjected to a chloride solution, preferring chloride of lime used in the same manner and proportions as when dyeing cotton goods in light colors. This light cold bleaching applied to woolen goods adapts them for taking dyestuffs. Extraneous fibrous matters combined with wool are dyed by adding general mordants to the acid bath, used after the chlorine bath either at the middle or end of the process, or preferably when the goods are taken out of the chloride bath ; wool may be placed in the mordant bath without being previously washed. If highly concentrated dyestuffs are used, the extraneous matters will be dyed without putting the mordant into the acid bath ; dyestuffs are forced into the fabric by

rollers or other means, which should also be used for forcing chloride and other liquors into the fabric. Chloride solutions may also be used for preparing woollen fabrics for being printed, the same preparation being adopted. When chloride solutions are used for preparing wool for being dyed cold, the cream of tartar usually employed may be dispensed with.—Silk, bristles, hair and feathers, and wool, and various threads, yards, and fabrics, may be treated by a cold process, to prepare them for being dyed and printed by a cold process by a metallic, alkaline, or other chloride or hydrochloride, as, for example, chloride or hydrochloride of iron will allow of mordanting being dispensed with. Chlorides or hydrochlorides are more energetic when used after the chlorine liquor. These preparing or mordanting agents are used in the same proportions as in ordinary dyeing. Coloring matters obtained by a cold process are preferable to those produced by a warm process.

The best operation for dyeing woollen and silk yarns and fabrics by a cold process is the following:—After the goods have been in the chloride liquor for half an hour, and worked or handled therein two or three times, they are taken out, and the moisture is expressed by a roller; then (after washing them or not) they are placed in a concentrated dye-liquor, in which they are kept about half an hour, and worked about in it twice or thrice and pressed, and they are then washed or not. They are then (during the same day) placed in a third liquor, consisting of a metallic salt, which develops the color produced by the coloring matter or dyestuff, and they are kept in this liquor till the required shade appears.

319*g* For light colors, such as grey, violet, pink, garnet, brown, and blue, the third liquor is not used.

Dyeing cotton yarns and fabrics, especially cotton velvets.—In dyeing yarn, thread, cotton, velvets, and other cotton fabrics black, the process may be commenced and finished by dyestuffs and well-known processes; but in order to remove or preclude the coppery shade which logwood imparts, and to bring out the blue-black tint, which lies beneath and is produced by the coloring principle of the logwood, they are finished in a decoction of from 4 to 8 lbs. of one of the mordants of the numerous tannins, excepting sumach; the agent preferred is wood of oak, and especially the wood of very old red odorous mountain oak taken from near the soil. A third or fourth part of gall-nut may be mixed with it to improve the liquor, though wood of oak alone is sufficient. The same process may be employed for giving the first or preparatory black dye (piéter) to the material when in piece or in yarn; or it may be mixed with logwood or other tannin in the liquors used subsequent to this first or preparatory process (piétage). Sulphate of zinc, pure or combined with sulphate of iron or copper, will also impart a rich black with logwood.

I may mention that all degrees of areometer hereinafter or hereinbefore mentioned are degrees Beaumé.

Sumach sometimes turns to an unpleasant greenish tint, and when its tannin is fixed on yarns and fabrics it resumes its previous color even after the goods have been dyed black. This fact,

which does not appear to be generally known, accounts for the green hue which black goods finished by sumach sometimes assume after a little time, and which shows after the velvet is dressed or gummed by highly heated rollers. This does not take place when instead of sumach the wood of oak or oak tannin or other known tannin is used in a proportion of 4 to 8 lbs. per 438 gallons of water; and, on the contrary, the black becomes darker, and improves by the dressing process and by time. When threads and fabrics are to be dyed with tannin alone, and especially with the wood of oak (which gives an agreeable blue-black shade), the specific gravity of the dye liquor should be from $\frac{5}{10}$ to $\frac{9}{10}$ of a degree of the areometer, and should be used cold or lukewarm for from two to ten hours or longer; the goods are then removed from the liquor after having been worked about every hour, and are left at rest for some hours before being washed carefully, and they are then soaked in a cold liquor of about 1° Beaumé of some sulphate of iron which yields a good deal of black, that is to say, very brown (not a greenish) sulphate. The goods are worked about until the desired shade of black is obtained. If the tint is not dark enough, the
319*h* goods are returned into the tannin liquor after having been well washed, and are kept in such liquor for about an hour. Lastly, they are subjected to a liquor of brownish sulphate of iron, to which a little pyrolignite may be added to render the shade darker. If it be desired to keep the goods in the tannin liquor for an hour only, they should be finished off by logwood according to ordinary processes, and by very brown sulphate of iron, with or without common sulphate of iron and sulphate of copper, according to the shade of black desired, but they are always finished in a solution of wood of oak, the action of which is above described. When sumach is used, and it happens to be a little too strong or the goods are kept in it a little too long, the goods lose their color, whereas when wood of oak is used a better blue black is obtained.

Dyeing of cotton velvet being important, I next describe the various operations. First, the velvet may be dyed by coloring matters and by the usual processes, with or without brownish sulphate of iron mixed or not with ordinary sulphate, or else the velvets may receive a preparatory or preliminary black dye (piétage) by tannin or logwood; in the former case only brownish sulphate of iron is used, and in the latter ordinary sulphate, if desired; but for finishing them, logwood and brownish sulphate of iron, with or without sulphate of copper, according to the shade of black to be obtained, is always used; or green and brown sulphates of iron may be combined in any proportions, or either of them may be used. As soon as the velvet is finished the dyeing is complete. The tannin liquor, like sumach, has no purpose other than to prepare the goods. Oak wood is employed instead of sumach for finishing velvets or for any other purpose for which sumach is used in dyeing; it is cheaper and stronger than sumach. Any fancy color may be produced by the wood of oak according to the mordant employed; such mordants are enumerated in the early part of the specification, and with any of these oak will combine. For dye-

ing goods of brown or other colors alder flowers or fruits may be used instead of dyer's weed; so also may nut-tree leaves, which indeed act as auxiliaries to or substitutes for cachou.

Fixing tannin on skins and hides.—The astringent portions of alder fruits and flowers, oak, and other matters containing tannin will not only dye black when fixed with salts of iron on threads and fabrics, but they also produce leather when applied to skins and hides, such leather being dyed when in contact with the gelatinous portions of skins and hides, that is to say, wood of oak in a state of powder, sawdust, or shreds may be used instead of and in the same manner as oak bark. The oak preferred for the purpose should be old, and the same as that preferred for dyeing.

319*i* To prevent leather from being too stiff or liable to crack, and to give it a good grain, about a quarter or third parts in quantity of oak bark, or about as much as would cover the skin in the tan pit, may be added.

The most important features of this specification consist—

First, in the use of general mordants.

Second, in mordanting and dyeing all goods in a single bath or liquor, especially in dyeing wool cold without cream of tartar.

Third, in preparing and dyeing yarns, materials, fabrics, and goods by wood of oak by the processes described.

Fourth, in employing tannins, and especially tannin of wood of oak instead of sumach, for preventing logwood from giving a coppery tint to threads and yarns.

Fifth, in combining the wood of oak with logwood for dyeing black.

Sixth, in using wood of oak instead of sumach for fancy and other colors.

Seventh, in using alder flowers and fruits instead of dyer's weed as described.

Eighth, in using nut-tree leaves, as described.

Ninth, in using the wood of oak for obtaining new colours.

Tenth, in using tannin of the wood of oak for tanning or producing leather.

Eleventh, in preparing goods and materials for printing as described.

Having now described the nature of the said invention, and in what manner the same may be performed, I declare that I claim the improvements in dyeing and tannin, and in preparing for dyeing and printing, hereinbefore described.

In witness whereof, I, the said Michael Henry, have hereunto set my hand and seal, this twenty-third day of March, one thousand eight hundred and sixty-five.

M. HENRY. [L. S.]

Witness—

S. E. A. NEWSOME,
Patent office, 84 Fleet street.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1865.

320 Circuit Court of the United States for the Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD, Complainants, Appellants,
vs.
HENRY GERBER and ANTON ANDREAS, Defendants, Appellees.
(Complainants' Appeal.)

To the honorable the Supreme Court of the United States:

The appeal of John T. Underwood and Frederick W. Underwood, complainants and appellants, respectfully showeth—

That on the 13th day of October, 1887, the above-named complainants and appellants filed their bill of complaint in the circuit court of the United States for the eastern district of New York (in equity) against the above-named defendants and appellees to enjoin and restrain them from infringing certain letters patent of the United States, No. 348,073, for improvement in reproducing surface for typewriting and manifolding, in the said bill of complaint set forth, and also praying, among other things, for an account of profits and assessment of damages arising from said infringement; that a subpœna thereupon issued out of the said circuit court and was duly personally served upon the said defendants; that the said defendants filed their answer to the said bill of complaint, among other things, denying the validity of said letters patent and infringement thereof; to which answer the complainants duly filed a general replication.

321 That proofs were taken on the part of the complainants and defendants, and such other proceedings were had that on the 1st day of February, 1889, the said cause was duly brought on for final hearing before the court and heard upon the said pleadings and proofs; and thereafter, on the 13th day of February, 1889, a decision was made and filed wherein, among other things, a decree was directed in favor of the defendants.

That thereafter the complainants moved the said court for leave to amend their said bill of complaint, and for other relief; which motion was conditionally granted by an order entered on the 20th day of March, 1889, pursuant to which order costs were thereafter taxed; and on the 26th day of April, 1889, a final decree was entered dismissing the complainants' bill of complaint, with costs to the defendants taxed at the sum of $542.31; which said judgment and decree these appellants believe to be erroneous, and, conceiving themselves thereby aggrieved, they appeal to the Supreme Court of the United States from the whole of the said decree of the said circuit court, and they respectfully pray that this their appeal may be allowed and that a transcript of the record, pleadings, and evidence in the cause, duly authenticated, may be sent to the Supreme Court without delay, and that the said Supreme Court may proceed to hear the case anew or such other decree made as to the said Supreme Court shall seem just.

JAS. A. HUDSON,
Complainants' Solicitor.

The foregoing appeal is allowed.
Dated New York, May 8, 1889.

E. H. LACOMBE.

Endorsed: Appeal. Filed May 8th, 1889.

322 United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD *et al.*
vs.
HENRY GERBER *et al.*

We hereby consent that the foregoing shall constitute the record to be certified by the clerk on appeal from this court to the United States Supreme Court in the above-entitled cause, without prejudice, however, to either party to move to correct the same if any error shall hereafter be found therein, and we further consent that all exhibits shall be retained by the clerk of this court until the hearing of the said cause in the Supreme Court.

JAMES A. HUDSON,
Sol'r for Compl'ts, Appellants.

I sign the above consent with the understanding that the opinions of the circuit court which are annexed to this transcript are part of the record to which this stipulation applies.

ARTHUR V. BRIESEN,
Counsel for Appellees.

323 Circuit Court of the United States for the Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD, Complainants, Appellants,
vs.
HENRY GERBER and ANTON ANDREAS, Defendants, Appellees.
} In Equity.

On reading and filing the annexed stipulation, and on motion of James A. Hudson, solicitor for complainants—

It is ordered that the complainants have leave to deposit the sum of one thousand dollars with the clerk of this court, pursuant to said stipulation, as security on their appeal from the decree rendered herein on the 26th day of April, 1889, and in lieu of the usual bond on such appeals.

Dated New York, May 7th, 1889.

E. HENRY LACOMBE.

Execution stayed for three days.
May 7, 1889.

E. H. LACOMBE.

Circuit Court of the United States for the Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD, Complainants, Appellants,
vs.
HENRY GERBER and ANTON ANDREAS, Defendants, Appellees.
} In Equity.

Whereas the complainants herein are about to appeal to
324 the Supreme Court of the United States from the final decree herein entered the 26th of April, 1889—

It is hereby stipulated and agreed by the respective parties to this suit that the complainants may deposit in the registry of this court the sum of one thousand dollars as security to defendants that the appellants will prosecute their said appeal to effect and to answer all costs and damages and interest that the respondent- may recover herein under said decree and under any decision or decree of the Supreme Court or proceedings to be thereon based.

It is further stipulated that the deposit of said sum of one thousand dollars, when made in the registry of this court, as above provided, shall be in lieu of the usual supersedeas bond on appeal, and that an order in accordance with this stipulation may be entered herein *ex parte* by either party to the suit.

Dated New York, May 7, 1889.

A. V. BRIESEN,
Of Counsel for Def'ts.
JAMES A. HUDSON,
Of Counsel for Compl'ts.

Endorsed: Stipulation and order for deposit in lieu of bond. Filed May 8th, 1889.

324*a* United States Circuit Court, Eastern District of New York, *ss:*

I, B. Lincoln Benedict, clerk of the circuit court of the United States for the eastern district of New York, in the second circuit, do hereby certify that the foregoing pages, numbered from 1 to 324, inclusive, contains a true and complete transcript of the record and proceedings had in said court in the case of John T. Underwood and Frederick W. Underwood against Henry Gerber and Anton Andreas as the same remain of record and on file in my office.

In testimony whereof I have caused the seal of the said court to be hereunto affixed this 11th day of October, in the year of our Lord one thousand eight hundred and eighty-nine, and of the Independence of the United States the 114th.

B. LINCOLN BENEDICT, *Clerk.*

[The Seal of the Circuit Court, Eastern District of New York.]

325 U. S. Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD
vs.
HENRY GERBER and ANTON ANDREAS.

For the complainant-:

James A. Hudson, Esq., cited (to the point decided in opinion) Railway Signal M'f'g Co. *v.* B'way & 7th Ave. R. R., 22 Fed. Rep., 655; McMullen *v.* Ress, 1 Fed. Rep., 722.

For the defendant-:

Arthur v. Briesen, Esq., cited (to the same point) Mahn *v.* Harwood, 112 U. S., 354; Mosler Safe and Lock Co. *v.* Mosler, 127 U. S., 354; Suffolk *v.* Hayden, 3 Wall., 315; Morris *v.* Huntington, 1 Paine, 348; Matthewson *v.* Fowler, 25 Fed. Rep., 830.

LACOMBE, *Circuit Judge:*

This is a suit brought to restrain the defendants from infringing letters patent 348,073 granted to the complainants August 24th, 1886, for "an improved reproducing surface for typewriting and manifolding."

The circumstances of the case are peculiar and present what seems to be a novel question.

On March 22nd, 1886, the complainants filed their application (known as serial number 196,200). The patent issued thereon and now sued on sets forth that the invention relates to an improved reproducing surface adapted to be employed for obtaining copies of typewriting or other printed or written impressions by means of a typewriter or other printing device or by the employment of a stylus or other writing means; that the transfer surface is spread
326 upon a sheet or vehicle, and, when so applied, is adapted to be employed in place of the article of trace commonly known and designated as "carbon papers" or "semi-carbon papers."

The specification then proceeds as follows:

"('Carbon papers' or 'semi-carbon papers') are employed by typewriters and others to produce copies of impressions either obtained by a machine or by a stylus or other writing means.

"In carrying out our invention we employ in the manufacture of our improved transfer-surface dye-wood solutions or their active principles which we filter and precipitate with alkalies and mineral salts, or with alkalies, acids, and mineral salts, or with acids or alkalies alone. After the solution had been filtered the precipitate is removed from the filtering device and dried. The precipitate is then mixed with lard oil and wax or their equivalents, and the mixture is then ground together in a warm state.

"The dye solutions we prefer to employ are obtained from logwood or hæmatoxylin, the active principle of logwood, Brazil wood, sapan wood, peach wood, madder, or its active principle—alizarine.

"The proportions we find to answer well in producing our improved surface are as follows: Take one pound of extract of logwood and dissolve the same in one gallon of water, then add to the solution one pound of soda and one pound of mineral salt, using one of

the salts of iron or copper, preferably sulphate of copper. The mixture thus obtained in then placed in a filter. After the solution has been filtered the precipitate is removed from the device employed for filtering and then dried, after which the precipitate is ready for use. To every two pounds of precipitate thus obtained we add one pound of oil and one pound of wax, and then grind the mixture in a warm state in what is commonly known as a 'paint' or
327 other suitable grinding mill. The heated mixture thus obtained is then applied to tissue paper or other suitable paper or fabric by means of a sponge or other suitable transferring device.

"The paper os fabric to which our improved surface is applied is placed upon a heated table, by preference formed of iron and heated by steam, but this may be varied.

"In place of employing oil or wax, or both combined, we can employ any other suitable oleaginous matter or combination of oleaginous matter having equivalent or approximately equivalent properties."

The invention having been thus described, the patentees claimed "a sheet of material or fabric coated with a composition composed of a precipitate of dye matter, obtained as described, in combination with oil, wax, or oleaginous matter, substantially as and for the purposes set forth."

On the same day (March 22, 1886, serial number 196,199) complainants also applied for a patent for a "composition for transfer surfaces for producing copies of typewriting," and letters patent therefor (No. 348,072) were issued to complainants on the same day as those sued on—August 24, 1886.

The specification sets forth that the invention relates to the process of producing a transfer surface adapted to be employed upon a sheet or vehicle to take the place of the articles of trade commonly known and designated as "carbon papers" or "semi-carbon papers." It then states that these papers are employed by typewriters or others to produce copies of impressions either obtained by a machine or by a stylus or other writing means, and proceeds to describe the invention in the identical words used in the other patent and quoted above.

328 Having thus described their invention the patentees claimed:

"The coloring composition herein described for the manufacture of a substitute for carbon paper, composed of a precipitate of dye matter, in combination with oil, wax, or eleaginous matter, substantially as set forth."

This novel method of manifolding an invention was adopted, as complainants state, in order to comply with recent decisions of the Patent Office, interpreting rule 41 of that office, and holding that where a person has "invented something in an art, or as it is ordinarily called 'a process,' also a machine for carrying out the process, and also the manufacture or article which is produced in the operation or the process by the machine," he must take out three

separate patents, one for the process, one for the machine, and one for the product.

Ex parte Blythe, 30 O. G., 1321.
Ex parte Herr, 41 O. G., 463.

Before those decisions the patent would have contained the common specification above quoted with two separate claims, one for the process and resulting composition, the other for its combination with the paper. The complainants insist that their position is precisely the same, whether their invention is covered by a single patent with a double claim or by two separate patents. Whether this is so under the circumstances of the particular case here presented must be now determined.

The defendants insist that no invention is set forth in either patent, and that they do not infringe. For the purpose of the argument upon the preliminary objection, however, the converse of these propositions will be accepted.

The present application is to restrain the defendant from continuing to infringe, and for some unexplained and unaccountable reason the complainants sue only on a single patent, and that,
329 too, the one whose numbers would indicate that it was, in time of application and of issue, subsequent to the other. Having taken their stand solely upon this patent, what is their position towards defendants, who make the composition of matter described in both patents, and combine paper with it as indicated in both patents, and combine paper with it as indicated in the one sued on?

When differentiated from each other it is found that the only step in advance, which the higher numbered patent suggests is the spreading upon paper of the composition described in the lower numbered patent. In view of the earlier patents and publications which have been put in evidence, in fact considering only what is within the common knowledge of all who have for upwards of a generation manifolded writing by the use of a paper coated or impregnated with some pigment, it is difficult to see how even the Patent Office could detect novelty or invention in merely taking a colouring substance already known and applying it to paper. If the patent for the composition of matter forming the colouring substance had been granted to John Doe the day before complainants applied for their patent covering the application of that substance to paper, the latter would be clearly void for want of novelty or invention.

It follows that if the first numbered patent were held by an assignee of the complainants, near or remote, he could not be held an infringer of the second patent. Complainants conceded upon the argument that an assignee could not be so held except for the combination of paper with the colouring substance for the purpose named. Such a combination is clearly old.

The complainants insist that their position is precisely the same as if they held a single patent with two claims, one for the process or composition of matter producing the colouring substance, the

other for the combination of that substance with paper.
330 This might be so if they could be considered as holding both patents; but in this suit they have carefully abstained from declaring upon the first patent or even in any way referring to it. Its issuance is only known to the court through the defendants, who set it up in defence. The complainants base their claim to a monopoly solely upon the second patent. As that single patent, tried by the usual tests, may stand or fall, the case which they make out upon their complaint must also stand or fall. One who seeks to enforce the rights secured to him by a patent is an Ishmaelite—his hand against every one and every one's hand against him. His adversary may avail of every publication of the fruits of human invention—by letters patents, by printed books, by actual public use—as if they were his own. When offered in evidence they may prove not conflicting, not anticipatory, or be found otherwise immaterial, but for what they are worth, they are the common property of all who are called upon to justify their acts in the face of a complainant patentee. The holder of the patent sued upon in this case must submit it to comparison with the first patent, as if that first patent were outstanding. By not declaring upon it as its present owner he leaves it to the defendants to be availed of as if it were the property of a stranger.

What, then, is his position?

At the very time when his patent was issued the composition of matter which enters into his combination with paper was known, and the right to exclude all persons from making it was conferred upon the holder of another patent. Upon the holder of the patent sued upon was conferred the right to exclude all others from combining paper with this composition, but, in view of the state of the art, such a grant was void.

331 The cases cited by complainant (Railway Signal M'f'g Co. *vs.* B'way & 7th Ave. R. R., 22 Fed. Rep., 655, and McMillen *vs.* Ress, 1 Fed. Rep., 722), do not apply. There it was held that the additional combination which the original inventor sought to secure by his later patent was in fact a real step in advance. It was held that the description of his invention in the earlier patent would not preclude him from securing his additional claim, because that additional claim covered a patentable invention. "Whether two patents," says the court in the case last cited, "cover the same invention must be determined by the tenor and scope of their claims, not by the description in the specifications." Here, as we have seen, the combination which the second patent sought to cover was not patentable. This suit, based upon it alone, must therefore fail. To the holder of the first patent, whoever he may be, alone belongs the right to exclude all others from making the new composition of matter, the only invention which (if the other issues in the case be decided against the defendant) was sufficiently novel to warrant the granting of letters patent.

Usual decree for defendant.

February 13, 1890. E. HENRY LACOMBE.

Endorsed: Opinion. Filed February 13th, 1889.

32—217

332 United States Circuit Court, Eastern District of New York.

JOHN T. UNDERWOOD *et al.*
vs.
HENRY GERBER *et al.*

Motion for Leave to Amend and Take Further Proofs.

The complainants in this case were defeated at final hearing because they declared only on one of the patents granted for their invention. (See the decision, 37 Fed Rep., 682.)

Thereupon complainants moved for leave to amend the bill by declaring also upon the other patents and charging infringement thereof, and to reopen the case for the purpose of letting in such further evidence as may be necessary.

For the complainants James A. Hudson, Esq., cited Neale *v.* Neale, 9 Wall., 9; Tremaine *v.* Hitchcock, 23 Wall., 518; Hamilton *v.* Southern Nev. Gold Co., 23 Fed. Rep., 563; U. S. *v.* Parrott McAll, 447; Harding *v.* Boyd, 113 U. S., 761.

For the defendants Arthur v. Briesen, Esq., cited (in addition) Shields *v.* Barrow, 17 How., 144; Battle *v.* Ins. Co., 10 Blatch., 426; Snead *v.* McCoull, 12 How., 422; Clifford *v.* Coleman, 13 Blatch, 210.

LACOMBE, *Circuit Judge:*

The amendment asked for does not involve an entire change of the character of the action. It is still a suit for the infringement of the same invention as that touching which the evidence al-
333 ready taken was introduced. So much of that evidence as was properly taken under the original bill would be necessary under the bill if amended as complainants pray. It would certainly be very unreasonable to require the parties at great additional expense to take it over again after both patents are declared upon. No good reason is shown why the court, if it has the power, should not also allow the record to be supplemented by such additional testimony as may be rendered necessary in consequence of the amendment. An early disposition of the case upon the merits at the least possible expense and, so far as appears, without doing injustice to either party would be thus secured. The authorities cited by counsel show that the granting of the relief now asked for is a matter of discretion, and within the power of this court at this stage of the case.

The complainants may amend their bill by the insertion of apt words so that the same shall declare on the omitted patent (No. 348,072), and also charge infringement of the invention therein set forth.

Upon service of the amended bill defendants may amend their answer as they may be advised, or may plead or demur to the amended bill.

Upon the raising of an issue as to the omitted patent the case is reopened, and additional testimony pertinent to that issue may be taken before a master or examiner.

This relief is granted only upon the complainants undertaking

to pay the expenses of taking all such additional testimony (whether introduced by complainant- or defendants), such expense to include witness fees, mileages, masters or examiners' fees, and printing.

March 6, 1889.

E. HENRY LACOMBE.

Endorsed: Opinion. Filed March 6, 1889.

334 Circuit Court of the United States for the Eastern District of New York. In Equity.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD, Complainants, Appellants,
vs.
HENRY GERBER and ANTON ANDREAS, Defendants, Appellees.

UNITED STATES OF AMERICA, *Eastern District of New York,* } *ss:*

By the Honorable E. Henry Lacombe, one of the judges of the circuit court of the United States for the eastern district of New York.

To Henry Gerber and Anton Andreas, Greeting:

Whereas John T. Underwood and Frederick W. Underwood have appealed to the Supreme Court of the United States from a decree lately rendered in the circuit court of the United States for the eastern district of New York made in favor of you, the said Henry Gerber and Anton Andreas:

Therefore you and each of you are hereby cited to appear before the said Supreme Court, at the city of Washington, on the second Monday of October, 1889, to do and receive what may appertain to justice to be done in the premises.

Given under my hand, at the city of New York, in the second circuit, on the 8th day of May, 1889.

E. HENRY LACOMBE.

335 [Endorsed:] 3, 64. U. S. circuit court for the eastern dist. of N. Y. In equity. John T. Underwood and Frederick W. Underwood, complainants, appellants, *vs.* Henry Gerber and Anton Andreas, defendants, appellees. Citation. James A. Hudson, solicitor for complainants, appellants, Temple court, New York. Due service of a copy of the within citation is hereby admitted. Dated New York, May 8, 1889. A. v. Briesen, of counsel for def'ts. Filed in the office of the clerk of the U. S. circuit court for the eastern district of New York this 8th day of May, 1889.

Endorsed on cover: Case No. 13,818. E. New York C. C. U. S. No. 217. John T. Underwood and John T. Underwood & Hannah E. Underwood, executors of Frederick W. Underwood, deceased, appellants, *vs.* Henry Gerber and Anton Andreas. Filed October 18, 1889.

CIRCUIT COURT OF THE UNITED STATES,

EASTERN DISTRICT OF NEW YORK.

JOHN T. UNDERWOOD and FREDERICK W. UNDERWOOD AGAINST HENRY GERBER and ANTON ANDREAS.	In Equity.

You will please take notice that the taxation of costs has been perfected in this suit, and that the costs as retaxed by the Clerk of the Court amount to the sum of $542.31.

This notice is served upon you pursuant to the terms of an order made herein by his Honor Judge Lacombe on the 20th day of March, 1889.

New York, April 13, 1889.

Yours, &c.,
BRIESEN, STEELE & KNAUTH,
Solicitors for Defendants.
A. V. BRIESEN,
Of Counsel.

To JAMES A. HUDSON, Esq.,
Solicitor for Complainants.

(Endorsed)—U. S. Circuit Court, East. Dist. of N. Y.—J. T. Underwood *et al. vs.* Henry Gerber *et al.*—Notice of Perfected Taxation of Costs.—Briesen, Steele & Knauth, Defts.' Solicitors, 229 Broadway, New York.—Due service of a copy of the within notice is hereby admitted.—N. Y., April 13, 1889.—James A. Hudson, Complts.' Sol.

149 US 224

Office Supreme Court U. S.
FILED.
APR 8 1893
JAMES H. McKENNEY,
CLERK.

Supreme Court of the United States.

OCTOBER TERM, 1892.

No. 217.

JOHN T. UNDERWOOD, *et al.*,

Appellants,

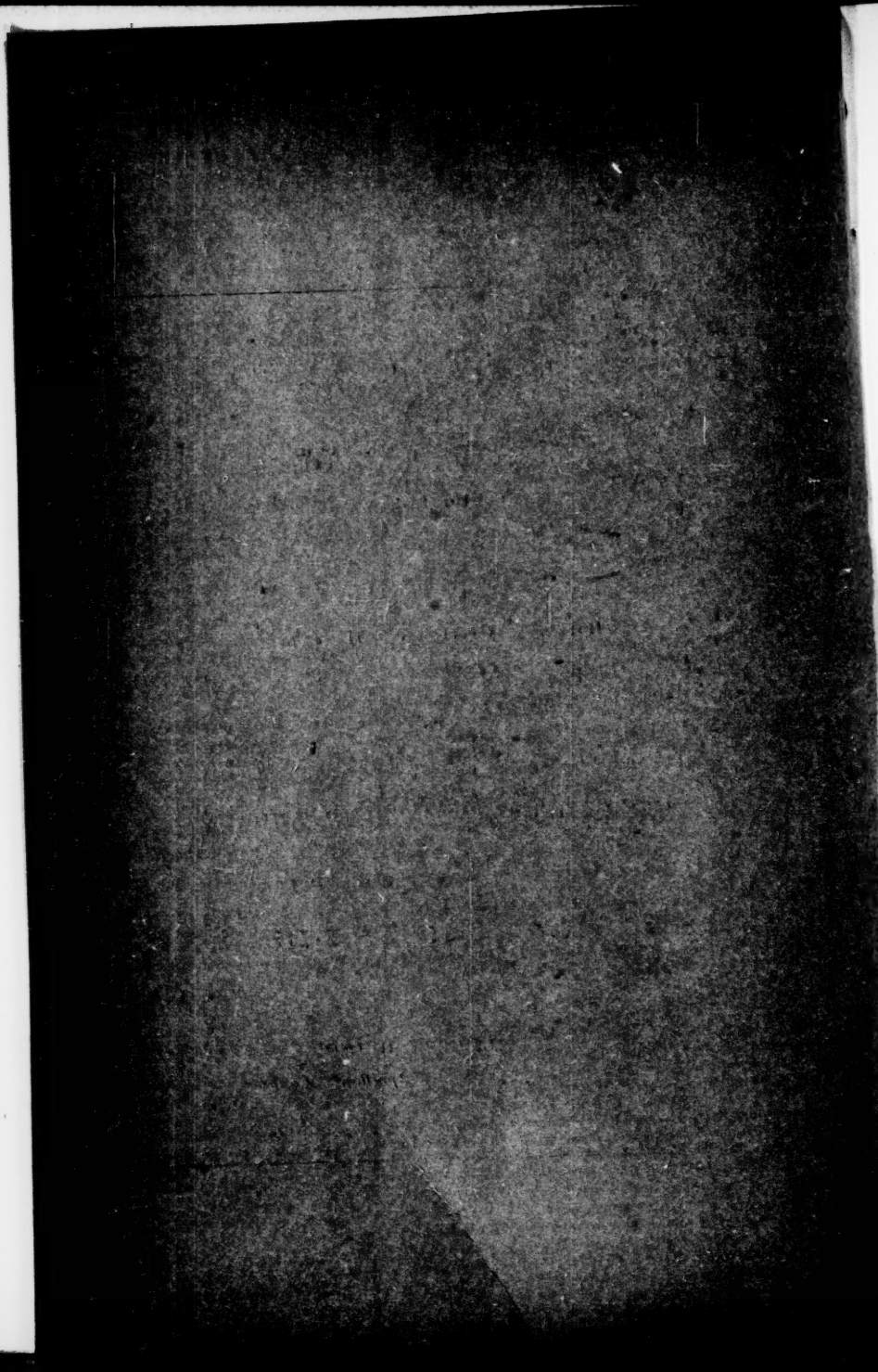
vs.

HENRY GERBER AND ANTON ANDREAS,

Appellees.

Brief for the Appellants.

JAMES A. HUDSON,
Appellants' Counsel.



Supreme Court of the United States.

JOHN J. UNDERWOOD *et al.*,
Appellants,

vs.

HENRY GERBER and ANTON ANDREAS,
Appellees.

Appellants' Brief.

Statement.

This cause comes up on appeal from a final decree in equity, entered in the Circuit Court of the United States for the Eastern District of New York, dismissing the bill of complaint with costs.

The bill was filed to restrain infringement of Letters Patent No. 348,073, that had been issued to the original appellants (complainants below), on the 24th day of August, 1886, as joint inventors, and to recover profits and damages for the infringement thereof.

After the cause was in this Court on appeal, one of the appellants died, and thereafter his personal representatives were duly brought in as co-appellants with the survivor.

The subject matter of the patent is an improved manifolding paper, of the class extensively used with the typewriting machines, for the production of multiple copies: the entire class of papers used for that purpose, being known in the trade and to consumers as "carbon papers," without regard to the materials of which their surfaces are composed.

The claim of the patent is for "a sheet of material or "fabric coated with a composition composed of a preci-

"pitate of dye-matter, obtained as described, in combina-
"tion with oil, wax, or oleaginous matter, substantially as
"and for the purposes set forth" (p. 180).

On the same day as the patent mentioned in the bill, and bearing the same date, but a number the next lower in series, another patent was issued to the same patentees, also as joint inventors, the claim of which is for the composition of matter that, in combination with a sheet of paper, is the subject matter of the claim of the patent in suit. The applications for these patents were filed on the same day, and that for the patent sued on bears a filing number the next higher in series to the one for the composition of matter.

The patent for the composition of matter was not in any manner referred to in any of the pleadings, but it was offered in evidence by the appellees (defendants), and marked under objection, and became the all important feature in the case; for, at final hearing, the Court considered that patent as being a patent prior in point of time to the patent sued on, and its contents as being prior public knowledge, and as such available in the defense of the suit; and finding the composition of matter that forms one of the elements of the combination claimed in the patent in suit to be fully described in that other patent, it was held that there was no invention in spreading that composition of matter upon paper, and thereupon the bill was dismissed (pp. 246-249). There was no evidence that the patentees had ever parted with any title or interest in that patent of lower number.

Assignment of Errors.

First.—That the learned Court erred in deciding that the Letters Patent, No. 348,072, were prior in point of time to the Letters Patent No. 348,073, declared on in the bill of complaint.

Second.—That the learned Court erred in deciding that the descriptions or recitations contained in the Letters Patent No. 348,072 could be considered as prior public knowledge available to the appellees (defendants) as a defense in this suit, or as evidence tending to show the state of the art for the purpose of determining the question of whether or not the patent sued on discloses patentable novelty.

Third.—That the learned Court erred in holding that the Letters Patent No. 348,072 should, for the purposes of the defense, be considered as though they were for an invention of prior date to the patent in suit and the rights thereby granted held by a stranger; in view of the facts that the record showed that the said Letters Patent and those in suit were applied for on the same day, and that both applications were made by the appellees, and that the patents were both granted to the appellees on the same day, and that there was no evidence that title to either of them had ever passed out of the said patentees.

Fourth.—That the learned Court erred in dismissing the bill of complaint at final hearing, on the question raised as a "preliminary objection," as stated in the decisions.

Fifth.—That the learned Court erred in admitting the Letters Patent No. 348,072 as evidence in the cause.

Sixth.—That the learned Court erred in dismissing the bill herein with costs, for that, on the evidence in the record in the cause, the Letters Patent mentioned in the said bill are shown to be good and valid, and the appellees (defendants) to have infringed on the rights thereby secured to the appellants, and that the title thereto was yet remaining in the said appellees.

In support of the foregoing assignments of error, the appellants respectfully submit the following points and considerations:

I.

The two Letters Patent specified in the first assignment of error having been granted on applications made by the same applicants, and filed on the same day, and having been followed by the grant of a patent on each of the applications, also on the same day, *the patents should be regarded as having been simultaneously applied for and simultaneously granted.*

Electrical Accumulator Co. *vs.* Brush, 61 O. G., 889.

Suffolk Mf'g Co. *vs.* Hayden, 3 Wall, 315–320. (s.c. 7 Am. & Eng. Pat. Cas.. 434–436).

There is nothing in the record to show, as a fact, which of these patents first actually received the official signature and seal.

II.

If the two patents above mentioned shall be considered as having issued simultaneously, then it follows that the disclosures of the one of the lower number were not available for use by the appellees as evidence of the state of the art prior to the application for or grant of the patent in suit, and it was error to permit it to be used for any such purpose.

III.

The contents of the patent of the lower number was the only evidence in the case bearing upon the question or title thereto, or ownership therein, and as it *recites grant to the appellants, presumptively they* remained the owners thereof at the time of the final hearing.

The *identity of the appellants* as being the

persons named in the patent, was established by the testimony of one of them (p. 103), on examination by the appelles.

IV.

If the Letters Patent No. 348,072 and the patent sued on are considered as having been simultaneously issued, then as the proofs are that the respective inventions therein described were simultaneous, *even* though it should be found that they are for the same invention, or that there is no patentable distinction when compared, the one with the other, we submit that it would be optional with the appellants on which one they would elect to sue, and the other could not be properly pleaded in the bill, nor put in evidence against the one pleaded ; probably, after election made, the one not sued on might, in such event, be held to be void.

At this point we desire to suggest the question whether, if this Court should find that there was error in the effect given to that patent of lower number, as evidence in the case, the trial ought to proceed further, in the first instance, in this Appellate Court.

The case was disposed of below, *practically on a motion that avoided a hearing on the merits*, as the Court styles it, on a "*preliminary objection*," and the same effect has resulted as if that question only had been raised by plea and argued on demurrer thereto, and the demurrer overruled and final judgment entered thereon.

The jurisdiction of this Court to try *all* of the questions that the record presents is not questioned, but the suggestion is made whether, (in view of the fact that if tried here in the first instance, the parties lose the benefit of a trial of the facts at Circuit, from which an appeal could be had to this Court, on

> the law), this Court will not, if it finds error in the grounds on which the decision was rested, merely reverse the judgment and remand the case to the Circuit for trial.

It may be argued that there is some language used in the opinion, from which it may be inferred that the Court looked into the case generally, and found that the claim of the patent in suit does not cover a patentable invention; but in *view of the assumption* of the Judge *at the beginning of his argument* in favor of sustaining the "preliminary objection," to wit: "The defendants insist "that no invention is set forth in either patent, and say "that they do not infringe. For the purpose of "the argument upon the preliminary objection, how- "ever, *the converse of these propositions will be* "*accepted*"; we do not understand that he intended to be understood as passing upon the question of patentable novelty or of infringement, adversely to the complainants, *save only* as he saw those results necessarily following upon his already expressed understanding of the effect, as evidence, of the patent of the lower number upon the rights of the parties under the patent in suit.

There is another question that may need a moment's attention before—if the Court shall so direct—we enter upon the trial of the cause on the merits, and that question arises on the following facts:

After the decision had been handed down, and before any decree had been entered upon it, a motion was made on behalf of the complainants for leave of the Court to amend the bill and therein plead the other patent also, and charge infringement of that patent and take proofs in substantiation of such new matters. The motion was granted conditionally, but the conditions precedent were considered so burdensome if not entirely impossible of compliance, that the complainants did not avail themselves of the provisions of the order, and in due course the decree from which this appeal is taken was entered.

We do not see how that motion or its results can

in any manner affect the standing of the complainants here, nor does it seem to us that the motion papers ought properly to have been part of the return made to this Court. The order left it to the discretion of the complainants to avail of its grace on its terms, or, failing so to do within a time limited therein, the relief asked was denied.

Before going into a general consideration of the evidence in the record, we desire to supplement the statement concerning the subject matter of the patent, as outlined at the beginning of the brief.

The language of the claim need not be repeated, but as it refers back to the body of the specification, we look into that and find that what is really claimed as new and covered by the patent is an article of commerce or product of manufacture, consisting of a thin sheet of paper or its equivalent, coated on one or both sides with a composition of matter that results from producing a precipitate from extract or solution of die wood by a treatment substantially as therein described, and after drying such precipitate, grinding it with lard, oil and wax, in substantially the proportions of two pounds of the dried precipitate to one pound each of the oil and wax.

It is evident from the language of the patent that the oil referred to in the claim is a non-drying oil; but, were the patent indefinite as to this, it is abundantly shown in the record that the requirements of use of the product necessitated the use of a non drying oil; and the art had reached a stage where the necessity for the use of an oil of that character was a matter of common knowledge.

Long prior to the date of this invention, as the record shows, it had been the common custom to make papers of substantially the same appearance as the papers of the patent, by mixing lampblack, and other forms of carbon, with the non drying oils, and spreading the mixture on thin paper, for uses similar to those mentioned in the patent in suit. From the papers so made the name "carbon

paper" arose, and has ever since been used as a kind of generic term to indicate all of the transfer-surfaced papers, without regard to whether they contained carbon or not. To improve upon that "carbon paper" by substituting a chemically prepared coloring matter for the carbon, and, if possible, get better results, was the task that the appellants set for themselves, and after long continued experimenting, they produced the product of the patent (pp. 34, 104, 123).

Needless repetition can, we think, be avoided by now considering the defenses that were set up in the answer.

But four of them appear to require attention, viz.:

a. Abandonment, by failure to apply for a patent until more than two years had elapsed after the invention was made.

b. Absolute anticipation.

c. Want of patentable novelty in the thing described and claimed in the patent—based upon the prior state of the art.

d. Denial of infringement.

Abandonment.

All of the evidence on this question is to be found in the testimony of the defendant Andreas, and in that of the two complainants (the patentees) who were called and examined at great length on behalf of the defendants.

Andreas came into the employ of the complainants at the end of 1880, and remained in their employ until in the early part of 1887, when his relations with the other employees became such that they all refused to work in the same shop with him (p. 32).

His employment consisted mainly in spreading the colored oleaginous mass on paper. The complainants offered to let him continue that work at home or other place out of the shop (p. 32), but he declined to accept the offer

and went away and induced the other defendant, then a butcher (p. 32), to go into the business of manufacturing. The patent had been issued, but he claimed that the complainants had lost all right to the invention because he believed that they had used it publicly for more than two years before they made their application for the patent.

The evidence shows that Andreas had not the knowledge sufficient to enable him to know, nor had he the opportunities to find out if he had had the requisite knowledge, what materials the complainants used in the manufacture of their papers before the actual issue of their patent.

Against any inferences that might possibly be drawn against the complainants from the testimony of Andreas on this point, there is the positive testimony of each of the complainants, elicited on the examination of the defendants (who by calling them as witnesses on their behalf, certified them to the Court as persons worthy of credence), to the effect that none of the ink-mass that was made and used by them in the manufacture of their "carbon paper" prior to the latter part of '84, was used otherwise than experimentally in their efforts to find a material that would be a substitute for the carbon in use, and be superior thereto.

They had long been manufacturers of writing inks, and they had some chemical knowledge in that line, and were also manufacturers of the lamp-black "carbon papers," and they believed that the precipitates of solutions or extracts of dye woods, required the admixture with the precipitate, of deliquescent salts, and chemical dryers to make them fit for use as the colored surfaces of the manifolding papers; and for several years they worked and experimented with that class of chemicals working late and early, but without success, and not until late in the year 1884 or early in 1885, did they discover that they could make a precipitate and oleaginous combination with it that would make a superior, sure-producing surface when applied to the papers used for the purpose, without adding any deliquescent salts or dryers to the precipitate obtained from the dye wood extracts (pp. 127, 131, 136). In that lay their invention, and at that period

of time it was made, and within two years thereafter they made application for the patent. Clearly on the evidence, all that was done by them prior to the latter part of the year 1884, was but experimental use, and abandonment cannot be fairly predicated upon it.

Beedle *vs.* Bennett, 122 U. S., 77.
Sinclair *vs.* Backus, 5 Bann. & Ard., 81.
Other cases cited in Walker on Pat. Sec. 95.

Non-Infringement.

A satisfactory *prima facie* case of infringement is made out on the testimony of Prof. Henry Morton, by whom specimen sheets of the defendants' manufactures were examined and carefully analyzed (pp. 14, 15). After analyzing the material that he found on the papers manufactured by the defendants, he made a precipitate by following the instructions of the patent, and then examined and tested it side by side with the materials that he had found on the defendant's papers, and the tests of each gave like results (pp. 15, 16). He found the dye matter (p. 16); copper, which must have been introduced as a salt, he says, for he knows of no other form in which it could have been introduced (p. 23), and he also found soda (p. 19). Soda and the salts of copper--preferably sulphate of copper, are the materials that the patent especially designates and recommends for use in the formation of the precipitate suitable for the purposes of the patent (p. 179). The other element of the combination claimed in the patent --the paper--was too obviously like that indicated by the patent, to require the services of a chemist to point out such fact.

These proofs we submit, were sufficient to show infringement.

Anticipation and Lack of Patentable Novelty.

It may be broadly stated without fear of contradiction, that there is no paper—evidence in the case that describes such a combination as that claimed in the patent; and we think, that it is also true, that the invention of the patent was not anticipated by anything that either of the witnesses, Fernald and Smith, called by the defendants, testified to having done.

At the most, those witnesses had used some of the commercial colors known as "lakes" at one time and another in more or less of an experimental way, in the production of such colors, other than black, that they desired to produce in the "carbon papers" of which they were manufacturers; and although, as John Underwood testified, there was a demand—"a general cry for something that would do better" than the old carbon papers, and Smith appears to have been alert for new improvements in the line, it does not appear that any of the papers that he produced met with favor. The reason is given in the testimony of Prof. Morton, who tells us, at page 172, concerning the "lakes" of commerce, that they were mainly composed of earthy matter stained with the coloring of the dye wood and entirely unfit for the purposes of the patent.

In their efforts to make out their defense of want of patentable novelty, or invention, the defendants have made a bulky record, the most serious trouble of which, to complainants, is its bulkiness. Not one of the articles that were read into the record teaches the making of the precipitate that is described in the patent, although in some parts, the general theory of precipitating dye matters are set forth. Nor do we find any of them indicating the admixture of a precipitate with oleaginous matters to make a pasty mass suitable for the uses of the papers of the patent. Prof. Morton, in his testimony discusses these articles somewhat, and to that testimony we would refer in lieu of further discussion of them in this paper (pp. 171–172).

Turning next to the patents that were marked in evidence as exhibits, and are printed with the record, we find but three of them that will require any attention; they

are the Wedgewood (British) patent of 1806; the Greene (British) patent of 1863; and the Cowan (U. S.) patent of 1869.

First, the Wedgwood Pat. (p. 199). Concerning it Dr. Sloan, an expert called by the defendants, said (pp. 141-2): "In this patent, therefore, is found described a carbon transfer paper consisting of a paper covered with a mixture of carbon or any other coloring substance with any kind of oil." The patent appears to warrant this broad statement, but such a statement does not do much toward advancing the progress of an art. To a consideration of that patent by Prof. Morton, appearing on page 166, we refer without further comment, other than, when we read toward the foot of page 200, that the duplicating paper can be used without the hard table, "by using such papers as will admit of a *ready absorption* of the coloring matter beneath it," we are lead to believe that the ink of that patent was of a character to *saturate*, rather than to remain on the surface of the transfer paper, and hence quite a step behind the carbon papers that the complainants were manufacturing at the time they made their invention.

The Cowan patent can also be dismissed with a suggestion that the conceded state of the art, as shown in the lampblack papers, was far in advance of what that patent teaches.

The Green patent, on the other hand, teaches certain methods of producing precipitates of dye woods, &c., but on a careful reading, we have not been able to find in it any instructions for the formation of a precipitate such as the patent in suit describes, or any suggestion that any one of the many methods described would make a precipitate fit for use with oil and wax as the coating surface of "carbon paper"; nor do we find any testimony that any of the preparations therein indicated, have ever been *tried* and *found to be suitable* for the purpose of the patent in suit.

It would seem that the very fact that there was the "crying demand" for a better article, that the witness John Underwood tells us of, and that these various manufacturers were all trying to make a better article, and that at least three of them besides the complainants—to wit, Rogers,

Fernald and Smith—were experimenting to that end, *with lakes;* raises a strong presumption that none of these matters of general information, so long open to the public, taught the production of a precipitate that could be used with suitable non-drying oleoginous matter, to make a pigment fit for use in the combination claimed in the Underwood patent.

Respectfully submitted,

JAMES A. HUDSON,
Of Counsel.

149 U.S. 224

Office Supreme Court U. S.
FILED.
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CLERK.

RECORD CASE 13,818.

Supreme Court of the United States,

OCTOBER TERM, 1892. TERM NO. 217.

JOHN T. UNDERWOOD AND JOHN T. UNDERWOOD AND HANNAH E. UNDERWOOD, EXECUTORS OF FREDERICK W. UNDERWOOD, DECEASED, *Appellants,*

vs.

HENRY GERBER AND ANTON ANDREAS.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF NEW YORK.

BRIEF ON BEHALF OF THE APPELLEES.

ARTHUR v. BRIESEN,
Of Counsel for the Appellees.

The Evening Post Job Printing House, N. Y.

Record Case No. 13,818.

Supreme Court of the United States.

OCTOBER TERM, 1892.

Term No. 217.

JOHN T. UNDERWOOD, and JOHN T. UNDERWOOD and HANNAH E. UNDERWOOD, Executors of Frederick W. Underwood, deceased,

Appellants,

vs.

HENRY GERBER and ANTON ANDREAS.

Appeal from the Circuit Court of the United States for the Eastern District of New York.

BRIEF ON BEHALF OF THE APPELLEES.

Statement of the Case.

This suit was brought to restrain the supposed infringement of a patent granted in 1886 to the original complainants below, to wit: Messrs. John T. and Frederick W. Underwood.

The specification of the patent in suit, which bears the number 348,073, will be found reproduced on pages 179 and 180 of the Record.

The invention of the said patent is in the specification stated to relate to "*an improved reproducing surface* "*adapted to be employed for obtaining copies of type-* "*writing* OR OTHER PRINTED *or written* IMPRESSIONS *by* "*means of a typewriter* OR OTHER PRINTING DEVICE *or by* "*the employment of a stylus or other writing means.*"

The specification then states that the "*improved transfer-surface is spread upon a sheet or vehicle,*" and is then adapted to be used in place of the carbon paper or semi-carbon paper used by typewriters and others.

It then continues:

"*In carrying out our invention, we employ in the* "*manufacture of our improved transfer-surface, dye-* "*wood solutions,* OR THEIR ACTIVE PRINCIPLES, *which we* "*filter and precipitate with* ALKALIES AND MINERAL SALTS, "OR WITH ALKALIES, ACIDS AND MINERAL SALTS, OR *with* "ACIDS OR ALKALIES ALONE. *After the solution has been* "*filtered, the precipitate is removed from the filtering* "*device and dried. The precipitate is then mixed with* "*lard-oil and wax or their equivalents, and the mixture* "*is then ground together in a warm state.*

"*The dye solutions we* PREFER *to employ are obtained* "*from logwood or hæmatoxylin, the active principle of* "*logwood, Brazil-wood, sapan-wood, peach-wood, mad-* "*der or its active principle—alizarine.*"

The specification then describes one particular precipitate, which is obtained from a mixture of extract of logwood, water, soda and a salt of iron or copper (preferably sulphate of copper). It then states that the precipitate thus formed is filtered, dried and mixed with oil and wax, and ground in a warm state in a paint mill.

It next proceeds to state:

"*The heated mixture thus obtained is then applied to* "*tissue-paper, or other suitable paper or fabric, by means* "*of a sponge or other suitable transferring device.*"

The claim is:

"*A sheet of material or fabric, coated with a composi-*
"*tion composed of a precipitate of dye matter obtained as*
"*described, in combination with oil, wax or oleaginous*
"*matter, substantially as and for the purposes set forth.*"

The specification was signed and the application for the patent filed in March, 1886.

The defendants, as the proofs show, sell a carbon paper which is covered with a composition in which, according to Professor Morton's analysis, was found, 1st, the *coloring matter of logwood* (fol. 26, p. 15); 2d, the substance *copper* (fol. 26, p. 15); 3d, *oleaginous substance* (Ans. 7, p. 14); 4th, *soda* (Ans. 13, p. 19).

From the fact that these four ingredients are found in the composition of defendant's paper, infringement of the claim of the patent is assumed. On this subject the testimony of *Andreas*, one of the defendants, is also important, he showing that from 1880 until 1882 he was in the employ of John Underwood, the complainant's father, and from 1882 till 1887 (Mr. John Underwood having died in 1882) in the employ of the sons, John T. and Frederick W. (p. 24); that during the term of this employment he prepared carbon paper for said complainants and their father in New Durham, New Jersey, and that defendants are using the same substance on their carbon papers that was used from 1880 to 1885 *continuously by the complainants and their father and by said Andreas while in their employ* (Ans. 17–21, p. 25).

Whether this showing would prove infringement of the patent granted in 1886 may well be doubted. But the case below was decided on the ground of the invalidity of complainant patent's.

It appears that on the same day on which the patent in suit No. 348,073 was issued, there was also issued *to the same patentees* (the complainants herein) another patent, No. 348,072, a copy of which will be found on page 192 of the record.

This patent 348,072 has in all respects the same descrip-

tive matter which is found in the patent in suit, the same formulæ word for word and the same statements of modifications. But it differs in its claim from the claim of the patent in suit.

The claim of Patent 348,072 is in these words:

"*The coloring composition herein described for the "manufacture of a substitute for carbon paper, composed "of a precipitate of dye matter, in combination with "oil, wax, or oleaginous matter, substantially as set "forth.*"

It will be seen that the two Patents 348,072 and 348,073 seek to cover different inventions, in this, that the one is for a certain composition, and the other for this same composition when spread on a sheet of paper or fabric.

To make this clear we here reproduce the claims of both patents side by side:

Claim of Patent No. 348,072.	Claim of Patent No. 348,073.
The coloring composition herein described *for the manufacture of a substitute for carbon paper*, composed of a precipitate of dye matter, in combination with oil, wax, or oleaginous matter, substantially as set forth.	A sheet of material or fabric, *coated with* a composition composed of a precipitate of dye matter, obtained as described, in combination with oil, wax or oleaginous matter, substantially as and for the purposes set forth.

The argument for the defense in the Court below in respect to these two patents was, that inasmuch as Patent No. 348,072 was not in suit, the complainants either did not own it, or if they did, could not hope to sustain it; that consequently in view of said Patent No. 348,072 the parties to whom the same was issued, being the complainants in this suit, could not be heard to claim that the patent in suit (No. 348,073) was for a new composition, but were forced to admit that it was only for spreading a known composition upon paper, and that as it was common to spread analogous compositions upon paper for making transfer surfaces, the patent in suit was void in failing to disclose any patentable invention over and above Patent 348,072.

The Court below in its opinion adopted these views, saying in its opinion (p. 248):

" *When differentiated from each other it is found that* " *the only step in advance which the higher num-* " *bered patent suggests is the spreading upon paper* " *of the composition described in the lower numbered* " *patent. In view of the earlier patents and publications* " *which have been put in evidence, in fact, considering* " *only what is within the common knowledge of all who* " *have for upwards of a generation manifolded writing by* " *the use of a paper coated or impregnated with some pig-* " *ment, it is difficult to see how even the Patent Office* " *could detect novelty or invention in merely taking a* " *coloring substance already known and applying it to* " *paper. If the patent for the composition of matter form-* " *ing the coloring substance had been granted to John Doe* " *the day before complainants applied for their patent,* " *covering the application of that substance to paper, the* " *the latter would be clearly void for want of novelty or* " *invention. It follows that if the first numbered patent* " *were held by an assignee of the complainants, near or* " *remote, he could not be held an infringer of the second* " *patent.* COMPLAINANTS CONCEDED UPON THE ARGUMENT " THAT AN *assignee could not be so held, except for the* " *combination of paper with the coloring substance for* " *the purpose named. Such a combination is clearly* " *old.*"

Upon the coming in of this opinion, which ordered a decree for the defendants, the complainants presented to the Court the affidavits of the complainants John T. Underwood and Frederick W. Underwood (p. 174), and of their attorney, James A. Hudson (p. 175), praying leave to amend their bill of complaint by the insertion of apt words, charging ownership and infringement of Patent No. 348,072 in addition the original charge of owenership and infringement of patent No. 348,073.

In view of the statements in these affidavits, the Court by an order filed March 20, 1889 (pp. 176 and 177), gave

leave to the complainants to amend their bill of complaint as prayed for, on condition that complainants pay all the costs of the proceeding up to that time, and on the further condition that the complainants pay all the expenses of taking testimony "hereafter." The order states further, that if the complainants shall fail to pay the costs that may be taxed in favor of the defendants within ten days, the bill be dismissed (see also Opinion, p. 250).

Notice of completed taxation was given on April 13, 1889, as appears from the last paper in the record. But the complainants apparently regarded the conditions of the order of March 20th as harsh (see their Appeal, p. 243). At any rate, they declined to accept the leave to amend granted them, and consequently a final decree dismissing the complaint, with costs, was entered on April 26, 1889 (pp. 177 and 178),

From this decree the appeal is taken.

DEFENDANTS' POINTS.

In support of the defense we will endeavor to show:

1st. That the order of March 20, 1889 (p. 176), was discretionary and cannot be appealed from.

2d. That by failing to take advantage of the leave to amend granted them by said order, the complainants stand in this litigation in the attitude of strangers towards the Patent No. 348,072.

3d. That in view of the Patent No. 348,072 the complainants cannot prevail under Patent No. 348,073.

4th. That the state of the art shows the complainants' patent in suit to be fully anticipated, and therefore void.

5th. That the patent in suit is void, because the complainants, for more than two years before application for

it was made, had put the supposed invention described in it upon the market in this country, by selling carbon paper coated with the composition in question.

6th. That the patent in suit is void, because of a deliberately insufficient and false specification.

7th. That it does not appear that defendants have infringed upon the patent in suit.

ARGUMENT.

1st. The order of March 20, 1889 (pp. 176 and 177), was discretionary and is not appealable.

The complainants came into Court under one patent—had their hearing on pleadings and proofs and were nonsuited. They then prayed the Court for leave to bring a *new* suit, in which the proofs already taken could be used. This leave was granted them on condition that the defendants, who had been successful in the first suit, should be put to no expense excepting counsel fees in the matter of taking whatever additional proofs the new bill and the new issue might render necessary, and on the further condition that defendants' costs under the old suit be first paid.

The complainants obtained this order on their own motion. Still they failed to avail themselves of its benefits. They did *not* pay the defendants' costs, and did *not* file an amended complaint. They preferred the final decree which was because of such selection on their part entered on the 26th of April, 1889 (pp. 177 and 178), and to appeal from *that* decree.

They cannot on this appeal claim that they ought to have obtained leave to bring the new suit on terms other than those imposed.

Nothing hindered them from bringing a new suit under both patents as an independent proceeding in the usual manner.

In Mulhall *vs.* Keenan, 18 Wallace, 342, 350, there had been in the Court below a motion for a new trial, based upon affidavits. Respecting the same the Supreme Court, speaking through Mr. Justice Swayne, said:

"*Such a motion was made, supported by the affidavits "of Mulhall, his counsel, and others, and was overruled "by the Court. With that motion and its result we have "nothing to do. They cannot be made the subject of re-"view by this Court.*"

In Ruch *vs.* Rock Island, 97 U. S., 693, 696, this Court (Mr. Justice Swayne) said:

"*The refusal to set aside the verdict and grant a new "trial cannot be considered here. It was a matter resting "in the discretion of the Court.*"

Equity rule 30 applies to cases such as this, in providing that a plaintiff who obtains leave to amend his bill of complaint and then fails to amend "shall be considered to have abandoned the same and the case shall proceed as if no application for any amendment had been made."

2d. The proceedings prior and subsequent to the order of March 20, 1889, leave the complainants in the attitude of strangers to Patent 348,072.

We have shown that the order of March 20, 1889, was discretionary. But it gave the complainants the right to come in and show that they were owners of Patent 348,072, and to claim that said patent had been infringed

by the defendants. *The complainants thereupon exercised their discretion in refusing or failing to assert title to said patent or infringement thereof.*

Having had the special opportunity granted them on their own motion, and failing thereupon to take advantage of the permission given, the complainants virtually confess that said Patent No. 348,072, although *granted* and *issued* to them (see testimony John T. Underwood, Ans. 61, p. 103) is not now their property, to a sufficient extent at least as to enable them to plead ownership of it, and they also by the same act confess that the defendants have *not* infringed upon it.

It matters not whether we regard one of the patents as anterior to the other. We are satisfied with complainants' contention below that the two patents 348,072 and 348,073 might be regarded as *one* instrument with two claims, of which one claim no longer belongs to plaintiff and the other does, or of which one claim is charged as having been infringed and the other not.

As the Court below says (p. 248): "*The complainants "insist that their position is precisely the same as if they "held a single patent with two claims, one for the process "or composition of matter producing the coloring sub- "stance, the other for the combination of that substance "with paper. This might be so if they could be con- "sidered as holding both patents; but in this suit they "have carefully abstained from declaring upon the "first patent, or even in any way referring to it. Its "issuance is only known to the Court through the "defendants, who set it up in defense. * * * "The holder of the patent sued upon in this case "must submit it to comparison with the first patent, as if "that first patent were outstanding. By not declaring "upon it as its present owner, he leaves it to the defend- "ants to be availed of as if it were the property of a "stranger.*"

We submit that the estrangement between the complainants and the Patent No. 348,072, which the Court below found to exist, has been greatly increased by the com-

plainants' failure to follow the invitation contained in the order of March 20, 1889, to bring that patent into this suit as a staff for complainants to lean on.

3d. In view of the outstanding Patent 348,072, complainants cannot prevail under the Patent 348,073.

We have already stated that these two patents have identical specifications, and that the one, *not in suit*, seeks to cover as new and claims a certain composition of matter "for the manufacture of a substitute for carbon paper," while the other patent, which is in suit, seeks to cover the paper or fabric, coated with said composition, obtained as described.

The Patent No. 348,072 the defendants have admittedly not infringed. But whether they have or not infringed upon this earlier patent, the second patent, which is the patent in suit, covers simply a sheet of material or fabric coated with the composition of the first patent.

This means, that in the second patent the complainants by implication *disclaim* what they claim in the first patent because they cannot secure the same matter twice. They consequently must be held to disclaim in the second patent the composition, *and claim only spreading it on paper*. This, of course, is not invention. If they have any invention, it is in the composition. Having the two patents, the one for the composition, the other for the composition spread on paper, they cannot be heard here to give to their Letters Patent in suit a construction which would make it cover the *composition*.

The Supreme Court, in the case of Mahn *v.* Harwood, 112 U. S., pages 354, 361, says, that whatever is not claimed in a patent is *disclaimed*, and belongs to the public.

For the purposes of this suit the composition itself is

disclaimed in the patent in suit, the only claim being for the paper having that which is disclaimed spread upon it. Of course that is not invention. Moreover, the Patent, No. 348,072, *describes* the spreading of the composition, which that patent covers, upon paper in the same words in which the patent in suit describes the spreading on paper. Hence there was nothing peculiar or novel in the later patent, 348,073, in the manner of spreading which would give validity to the later patent.

See Mosler Safe and Lock Co. *vs.* Mosler, 127 U. S., 354.

As long ago as 1806 an English patent of that year (see the Wedgwood Patent, pp. 199–202 of Record) described the production of a carbon paper in the following terms (p. 200, near middle):

"In writing by this mode I make use of a prepared "paper, which I call duplicate paper. This is made by "thinly smearing over any kind of thin paper with any "kind of oil, preferring those kinds of oil which are least "liable to oxygenizement, or to be evaporated by heat. "The ink made use of in this mode of writing consists of "carbon, *or any other coloring substance, and finely levi-* "*gated in any kind of oil.* * * * *This I call car-* "*bonated paper.* Or coloring matter of any kind and in "any other medium or vehicle may be used, providing "that medium be such as will admit of the coloring "matter being transferred to the duplicate and writing "paper; some coloring substances may likewise be used "without any medium or vehicle."

He then describes the use of beeswax, and says (page 201): "By this means, with a single pressure, a multiplic- "ity of impressions are formed at once."

Wedgwood, therefore, so far as the record informed us is shown to be the father of carbon paper. His invention was to smear the paper with oil and pigment—"Any coloring matter"—"Any oil." Now, if the pigment of complainants' patent, as Frederick W. Underwood, one of the complainants, testifies in answers 77 and 78, page 134, was

known at the time of the reign of Queen Elizabeth, then Wedgwood's specification was broad enough to cover this use of carbon paper, that is, the mixture of the precipitate of dye matter with the kinds of oil that are proper for producing a carbon paper. Clearly the Wedgwood specification alone, let alone the many other proofs in the case from which it appears to have been old long prior to 1886 to apply coloring matter with the aid of oil, wax or oleaginous matter to paper, makes it clear that *no invention was required* to spread the composition of Patent 348,072 upon paper.

Thus John T. Underwood, the other complainant, in answer 144, page 110, testifies as follows:

"Q. 144 (repeated). How long has the mixture of wax "and oil been *used*, TO YOUR KNOWLEDGE, in the making "of carbon paper?

"A. Wax and oil probably have been used in the neigh- "borhood of thirty odd years with lampblack or in con- "junction with ANY of the dry colors sold upon the market."

Whatever invention there was must be sought in the precipitate itself. To spread the same upon paper in the admitted old manner was in the year 1886 no invention.

Right here see the quotation from p. 151, which is printed on pp. 16 and 17 of this brief.

This is not a case where a man has two patents for the *same* invention, as in Electrical Accumulator Company *et al. vs.* Brush Electric Company, Vol. 61, Official Gazette, Patent Office, pages 886–889 (November 8, 1892), in which case the Circuit Court of Appeals for the *Second* Circuit held that the owner of two patents for the *same* invention has the right to elect the one upon which he will rest his title to a monopoly.

As the Circuit Court of Appeals for the *Third* Circuit says in National Cash Register Company *vs.* American Cash Register Company, Vol. 62, Official Gazette, Patent Office, pages 449–451 (January 17, 1893):

"*There is nothing upon this record which would war-* "*rant us in attributing to the patentee the folly of having* "*presented, and to the Patent Office, the improvidence of* "*having allowed two claims for the same thing.* THE DIS-

"TINCTION BETWEEN THEM MUST BE MAINTAINED, SO THAT "BOTH MAY BE GIVEN EFFECT."

In the case at bar the two patents properly seek to cover *different* inventions, the one a mixture, and the other the combination of that mixture, with paper. This combination claim is the only one in suit, and we submit that in view of what has been stated, it appears with sufficient clearness that the combination of the mixture with paper was not a patentable invention. If the complainants had hoped to prevail on their claim for the mixture they should have sued on Patent No. 348,072.

4th. In view of the state of the art complainants invented nothing.

The claim of the patent, which we have already quoted, seeks to cover the combination of three things: *first*, a fabric, such as paper; *second*, a precipitate of dye matter; *third*, oleaginous matter. The precipitate of dye matter disclosed by the specification of the patent is a pigment; and the oleaginous matter is the vehicle or carrier of the pigment—the means by which the pigment is conveyed to and held on the paper or other fabric. In this respect the "composition" in question is analogous to an *ink*, *paint* or *dye*. That the complainants themselves agree that what is used on this paper is an *ink*, appears from the testimony of John T. Underwood, one of the complainants in this case. In answer 198, page 114, he says: "We gave him the option of taking the *ink*, putting it upon the paper and returning them to us."

"Q. 199. What do you mean by ink?

"A. I mean such inks as we might give to him already ground, for the purpose of having it spread on the carbon.

"Q. 200. Do you call the mixture you put on paper ink?

"A. Yes, sir."

We therefore see that inks and the carbon mixture involved in this suit are substantially synonymous terms, not only because Underwood so says, but because inks have been known as mixtures of pigments with oils and with wax and tallow.

In an ink, if the same be a writing fluid, the pigment is mixed with water, which is the vehicle; if the ink be a printers' or lithographers' ink, the pigment is mixed with oil or the like; and in case of paints the pigments are mixed with the various oils, and other liquids, such as turpentine, and even water. In all these instances of inks, paints, dyes, &c., the pigments are connected with the liquids or semi-liquids for the simple purpose of being conveniently applied to and held in place on the surfaces which they finally are to cover. The chemist, therefore, very properly terms those liquid admixtures "vehicles." *It follows that the mixture of a pigment with its vehicle does not result in a composition, chemically considered, but only in a mixture;* because the pigment does not affect the vehicle or change its structure; nor does the vehicle affect the pigment or change *its* structure. A chemical composition is a mixture of ingredients in which each affects the other, causing a change in its appearance or structure.

Finding that the complainants' patent, therefore, seeks to cover the conjoint use of precipitate of dye matter and oleaginous matter with paper or other fabric, we will next see to what extent each of these three elements of the claim is limited by or described in the specification.

As Respects the Fabric.

The claim says, "a sheet of material or fabric." These words are in the specification explained as follows:

"Our invention relates to an improved reproducing-
"surface adapted to be employed for obtaining copies
"of type-writing or other printed or written impres-
"sions by means of a typewriter *or other printing device,*
"or by the employment of a *stylus* or other *writing means.*

" Our improved transfer-surface is spread upon the sheet " or *vehicle*. * * * The heated mixture thus obtained " is then applied to tissue paper or other suitable paper or " fabric by means of a sponge or other suitable transfer- " ring device."

It is not clear whether the invention is intended to be limited to a mere fabric, such as a woven ribbon and tissue, and other papers, or whether it is intended also for use in any kind of printing device, such as a lithographic press, or even on type. Clearly, whether the "composition" of the patent is pressed upon paper, to form reading matter, from a type, or from a sheet of paper placed beneath the type, can make no patentable difference. Whoever spreads this composition upon the transferring device, whatever that be, would seem to be, an infringer of this patent, if valid.

Thus Stephen T. Smith testifies that for the last ten or twelve years carbon *papers* were made in this country by the use of sundry pigments ground in wax and lard oil (Ans. 3, p. 49); that amongst the pigments so used were LAKES (Ans. 7, p. 49) which are precipitates of vegetable coloring matter (Ans. 8–10, p. 49), and that the witness six or seven years ago (his testimony was given in May, 1888), showed Mr. John T. Underwood, one of the complants, typewriter RIBBONS, saturated with oil and wax and a precepitate of a solution of logwood (Ans. 12–14, p. 50).

THE PRECIPITATE OF DYE MATTER.

This is described in the specification in these words:

" In carrying out our invention we employ in the " manufacture of our improved transfer-surface, *dye-* " *wood solutions or their active principles*, which we fil- " ter and precipitate with *alkalies* AND *mineral salts*, or " with *alkalies*, *acids* AND *mineral salts*, or *with acids or* " *alkalies* ALONE. After the solution has been filtered " the precipitate is removed from the filtering device

"and dried. * * * The dye solutions we prefer to "employ are obtained from logwood or haematoxylin, "the active principle of *logwood, Brazil-wood, sapan-wood,* "*peach-wood, madder,* or its active principle– *alizarine.*

"The proportions we find to answer well in producing "our improved surface are as follows: Take one pound "of extract of logwood and dissolve the same in one "gallon of water, then add to the solution one pound "of soda and one pound of mineral *salt,* using one of "the salts of iron or copper, preferably sulphate of cop- "per. The mixture thus obtained is then placed in a "filter. After the solution has been filtered the pre- "cipitate is removed from the device employed for filter- "ing and then dried, after which the precipitate is ready "for use."

We find, therefore, that by the precipitates of dye matter the specification means precipitates from dye-wood solutions or their active principles, such precipitates being obtained by adding to the solutions *either alkalies alone, or acids alone, or alkalies and mineral salts, or alkalies, acids and mineral salts.* The preferred formula given of logwood, soda and sulphate of copper is only recommendatory. The patentees did not limit themselves to this formula, for their specification distinctly shows, that *any* precipitate from dye-wood solution obtained with the aid of *any* alkali, or with the aid of *any* acid, or with the aid of *any* mixture of any alkali with any mineral salt, or with the aid of a mixture of any alkali with any acid and mineral salt, is intended to be within the scope of their monopoly; and the claim bears out this broad view of the specification, speaking of this precipitate in the general words "precipitate of dye matter obtained as described."

The Court will, on page 151 of the record, find the following:

"Counsel for defendants states, that he has but one other "witness to call, who will testify, that precipitates of dye "matter and lakes have been on sale in this country for

"more than ten years last past, and that they were sold as "PIGMENTS, in a dry condition, and were also sold to "customers, mixed with such oils as customers demanded, "and thereupon IT WAS STIPULATED by and between "counsel for the respective parties that Doctor I. W. Drum- "mond, chemist, of Devoe & Co., if called as a witness, would "testify as above set forth, and THIS STIPULATION IS "TAKEN IN LIEU OF SUCH TESTIMONY, and with the "same force and effect, that such testimony could have in the "case."

We will hereafter more fully show that the precipitate of dye matter described in this patent was, at the time of the supposed invention by the complainants, a well known pigment and that it was not the complainants' invention to produce this pigment in the manner in which their patent describes its production.

THE OLEAGINOUS MATTER.

The claim speaks of this as "oil, wax or oleaginous matter." The specification describes the oleaginous matter in these words:

"The precipitate is then mixed with lard oil and wax, "or their equivalents, and the mixture is then ground "together in a warm state * * * . To every two "pounds of precipitate thus obtained we add one pound "of oil and one pound of wax, and then grind the mix- "ture in a warm state in what is commonly known as a "'paint' or other suitable grinding mill * * * . In "place of employing oil or wax, or both combined, we can "employ *any other suitable oleaginous matter* or com- "bination of oleaginous matter having equivalent or "approximately equivalent properties."

Thus we see that the specification is not limited to any kind of oil.

Supposing now that it should appear, as it does appear in this case, that the precipitate of dye matter of complainants' patent was a well known pigment in 1884; that

it was a pigment kept for sale *as* a pigment in most every paint store, what right could the Government of the United States in 1886 give to the complainants which would deprive any painter from buying that pigment, mixing it with oil, and applying it to the door frame or to the walls of a house as a paint?

And if this patent does not and cannot restrain a painter from using this precipitate in an oil paint, it cannot prohibit a printer from using it as a printers' ink; nor a paper hanging maker from using it in the printing of wall paper; nor an ink maker from using it in the mixing of his writing or printing ink; nor a dyer from using it in the coloring of his fabrics. The whole gist of this "invention," therefore, rests in the question as to the novelty or antiquity of the precipitate of dye matter. If *that* is old, no invention is disclosed. No invention can be disclosed which consists in the mere mixture of even a *new* pigment with oil and its application to paper.

PAINTS, DYES AND INKS.

Before entering into a further consideration of this defense of anticipation we desire to call attention to the definition of "paints, dyes and inks," so that it may from the record appear that these three names are substantially synonymous, expressing mixtures of pigments with fluid or semi-fluid carriers or vehicles.

The article in the *Scientific American*, published in the year 1876 and reproduced on pages 60 to 62, speaks of logwood *inks* and shows how they have been prepared in former years. The following is taken from that article (p. 61):

"Decoctions of logwood to which alum has been added "give a reddish or violet color, which darkens slowly, "particularly with ink prepared from the wood and not "the extract. Such inks prepared with alum are costly, "because to obtain a sufficiently deep tint one is obliged "to employ decoctions or solutions of the extract in a

" very concentrated condition. *It is otherwise when a* " *metallic salt is added along with the alum. Alum pro-* " *duces a reddish purple color in decoctions of logwood,* " *while metallic salts produce in the oxidized solution of* " *the coloring matter a precipitate of a black or bluish* " *black color.* * * * (p. 62). *Sulphate of copper or* " *sulphate of iron* may be the metallic salt used in such " inks—the former is preferable."

Certainly this article shows that the precipitate of dye matter which complainants' patent describes was, in 1876, known as a pigment for the manufacture of *inks*.

Now the next question is, what are inks? The *Scientific American* article to which we have just referred, in its opening sentence, speaks of the inks to which it refers as " so-called copying inks."

On pages 151 to 165, inclusive, of record, will be found sundry receipts from *Dick's Encyclopedia of Practical Receipts and Processes*, published in 1883, to some of which we will now refer.

Recipe No. 2,547, on page 164, *shows that for lithographic inks the pigment is mixed with wax and tallow.*

Recipe 2,465, on page 152, speaks of black ink made of logwood chips boiled in water with galls and other vegetable dye matter, and treated with green copperas, which, as recipe 2,464, same page shows, is *sulphate of iron.*

Recipe 2,467, on the same page, speaks of logwood and green copperas; recipe 2,471 on page 153, of copperas and logwood; recipe 2,473, on same page, of logwood and copperas and blue vitrol, which is *sulphate of copper*, &c.

Recipe 2,494, on page 156, speaks of ink made of logwood, acetate of copper and alum; recipe 2,498, page 157, of Brazil-wood, alum and bitartrate of potassa; recipe 2,499, on same page, of Brazil-wood and muriate of tin; recipe 2,500, on same page, of Brazil-wood and alum; recipe 2,522, on page 160, of bichromate of potassa, extract of logwood and hot water.

Thus we see that in these old recipes, all of which were

published prior to the alleged conception of the invention by the complainants, lithographic and other "inks" were described as composed of pigments produced from precipitates of dye matter that are obtained with the aid of metallic and other salts and that are mixed, as are those in the recipe 2,547, with *wax and tallow.*

Thus *ink* is the proper term for that which under the complainants' patent is put upon the paper. That the complainants themselves agree that what is used on this paper is an *ink*, appears from the testimony of John T. Underwood, one of the complainants, in his answers 198–200, page 114, to which we have already referred.

We therefore see that inks and the carbon mixture involved in this suit are substantially synonymous terms, not only because Underwood so says, but because inks have been known as mixtures of pigments with oils and with wax and tallow.

On the question of *dyes*, we invite the Court to the beautiful article from *Ure's Dictionary of Arts and Manufactures*, published in 1866. This article is reproduced on pages 62 to 88 of Record, and is worthy of careful perusal. It shows, amongst others (see p 69), that stuffs have been dyed in the infusion or decoction of logwood under the influence of a base which acts upon the hematine (another term for extract of logwood) in the manner of an alkali, and says: "Such is the process for dyeing cotton and wool a logwood blue, by means of verdigris, crystallized acetate of copper and acetate of alumina." On page 69, near the bottom of page, the article says: "Galls, logwood, and salt of iron produce merely a very deep violet blue, but by boiling and exposure to air the hematate of iron is changed, becoming red brown, and favors the production of black. Galls and salts of copper dye stuffs an olive drab; *logwood and salts of copper*, a violet blue; hence, their combination should produce a black." The same article, on page 64, shows that the old Romans used alum and copperas (which, we have seen, is sulphate of iron) or other acids with madder, nut-galls, the seed of pomegran-

ate and of an Egyptian acacia. The same article, on page 73, contains the following:

"*If we mix a clear infusion of a dye with a small quan-*
"*tity of a solution of an earthy or metallic salt, both in*
"*water, the limpid liquids soon become turbid, and there*
"*gradually subsides sooner or later, according to the na-*
"*ture of the mixture, a colored precipitate, consisting of*
"*the altered dye united with a basic or subsalt.*"

Here we have, therefore, a full specification of the production of the complainants' patented precipitate. Special precipitates of this kind are described in the same article on page 74, Record, and still more on page 77.

From the same work another extract is published, under the title of "Black Dye." This describes the use of *logwood and sulphate of iron* (p. 80); and of logwood, gall nuts and sulphate of iron (same page).

On page 83, the same article, speaking of these precipitates, says:

"The most suitable proportion of sulphate of iron ap-
"pears to be that which corresponds to the quantity of
"the astringent matter, so that the whole iron preciptable
"by the astringent may be thrown down, and the whole
"astringent may be taken up in combination with the
"iron."

Another article from the same book, under the head of "Brown Dye," speaks (on p. 86) of a brown produced by a mixture of *logwood containing either sulpho tartrate, acetate, or sulphate of iron.*

The precipitation of dye matter is also referred to in the article reproduced from Ure's Dictionary, Supplement, on pages 88 to 97, inclusive, of Record (see p. 89, p. 90; and fol. 145, p. 91). The last mentioned reference is in these words:

"*Suppose, again, that the sulphate of iron be mixed*
"*with the logwood decoction, there will be produced the*
"*same color or dye as an insoluble precipitate.*" And

the article then shows that cotton fibre does not absorb this precipitate, but that woolen stuff imbibes it owing to the woolen fibres being much larger than those of cotton; that is to say, by capillary action, as was previously stated on page 90.

On top of page 96, a dye produced from Brazil-wood and a tin mordant is described.

On page 97, it is stated: "The Brazil-wood gives a red " tint, sumach and copperas the black tint, the logwood " assisting in this, and with the aid of the alum throwing " in the puce or dove neck hue."

Thus we see that the precipitate of dye matter of complainants' patent is used in dyes, dyes being pigments, mixed with liquids in such manner that the liquids will convey the small particles of the dye matter to the surface of the fabrics to be tinted.

It is not unfair, therefore, to assume that dyes and inks are analogous mixtures for the purposes of this suit. In fact, the complainants' patent itself admits the pertinency of the comparison with dyes, in using the term "*composition of dye matter*" in the claim; showing, therefore, that dye matter is intended to mean matter capable of use in a dye as well as in the ink composition of the patent.

For the further enlightenment of the Court on this subject we produce an article from Knight's American Mechanical Dictionary, published in 1875 (see p. 97 to 101 inclusive, of Record). This article is entitled "INK," and begins with these words:

" *Ink*, a colored liquid or viscous material used in writ- " ing or printing. The ancient ink was thick, and so is " the modern Chinese. Demosthenes reproached Aeschines " with laboring in the grinding of ink, as painters do in " preparing colors. There is a difference between a *paint* " and a *dye*, though the distinction is very imperfectly " made out in customary language. A paint is smeared " over an object, a dye colors or stains it. Some inks are " of one kind and some of the other."

This article then describes sundry inks, of which we shall give a few references. Thus, on page 98, a Japan ink is described consisting of galls, logwood, sulphate of iron, gum arabic, sulphate of copper, and candy. Then on the same page, it says: "*Red ink is a solution of alum colored with Brazil-wood or an* ammoniacal solution of cochineal." On page 99, folio 157, an ink is described consisting of an infusion of galls, and sulphate of iron. And on the lower part of the same page we find: "Red and other colored printing inks are made of linseed oil boiled into a varnish and with pigments of the required colors."

Enough has been shown, we think, to satisfy the Court of the analogy between paints, dyes and inks, so that as we go into a discussion of the state of the art the Court will be able to appreciate the substantial similarity of the substances with one another.

The State of the Art.

The answer of the defendants alleges that in view of the public and generally known state of the art at the time of complainants' alleged invention their patent is invalid for want of novelty. In support of this defense we refer to the article in the *Scientific American*, to the extracts from publications in Ure's Dictionary, Knight's Dictionary, and Dick's Encyclopedia, to which we have already heretofore at length referred. Also to the stipulation of page 151. From these articles and stipulations it appears that the precipitate of dye matter which is disclosed in complainants' patent was a well-known form used in the manufacture of inks and paints long before their invention. And we refer also to these extracts and publications to show that precipitates of dye matter have been mixed long before the patent, with oleaginous matters.

What are the *oleaginous* matters in the complainants' patent? We cannot get any more competent person to

answer this question than the complainant. John T. Underwood is asked, page 109, Record:

"Q. 137. When you speak in your patent, and especially "in the claim thereof, of oil, wax or oleaginous matter, "what other oleaginous matter other than oil and wax do "you have reference to?

"A. *Spermaceti, glycerine, or any other kinds of ole-* "*aginous matter.*"

So that even glycerine is brought in as an equivalent for any oil used.

Is there a question of *proportions* in the complainants patent for their composition? Here also we have the testimony of the interested parties. John T. Underwood, in answer 140, page 110, says: "In the patent the propor- "portions are not reserved as those which cannot be "varied from, and from a reading of the patent you will "find that it says: 'We find to answer well.'

"Q. 141. Then I understand you to say that the propor- "tions given are not essential?"

"A. Are not limited."

Thus we have here a patent which seeks to cover, in unlimited proportions, the admixture of any kind of oil, spermaceti, or glycerine with a well known dye matter, provided such admixture is spread upon paper or other vehicle.

In addition to the state of the art, to which reference has already been made, we invite the attention of the Court to a number of patents of a prior date.

The first is a patent granted to John Underwood in 1863. The testimony shows that he was the father of the complainants. He describes an invention which is to facilitate the printing or production of copies of printed, written or other characters, and says (column 1, Specification, p. 184):

"In carrying my invention into effect I print, write, or "otherwise mark upon paper (supposing paper to be the "material used) with a solution of an extract of logwood,

" or with a material or varnish soluble in water or other " like suitable vehicle, and when with the latter I dust or " throw over it extract of logwood in powder, and I treat " the paper (supposing paper being the material used for " this purpose also) upon which the impressions are to be " obtained with a solution of neutral chromate *of potash* " *or other agent which will have a like effect by precipi-* " *tating a colored material*, where the extract or powder " of logwood is absorbed, and use the paper so treated in " a damp state, the impression being taken in any suitable " manner.

" I do not confine myself to the use of logwood and " chromate of potash, or to chemical agents, &c., &c."

On page 185 he says:

" This invention is applicable to the production of copies " of maps, charts, plans and other similar prints or draw- " ings, as well as to ordinary written and printed papers " or designs."

The next patent is that of H. Holt, granted in 1865. It describes a composition for preparing ribbons for hand stamps, and says (p. 186):

" For the purpose of preparing these ribbons ordinary " printing ink has been used in the absence of some " better composition, and a ribbon thus prepared will " give about thirty (more or less) impressions on the " same spot."

He then says: " I prepare my new composition by dis- " solving aniline red, or any other of the well known ani- " line colors, in *glycerine* or any other *fatty material* " known as a solvent of such colors, and then I saturate " the ribbon therewith by applying the composition to it " with a brush, or by drawing the ribbon through it, or in " any other suitable manner."

The third patent is that of Charles Cowan, of 1869. It says (p. 187) that the invention relates to an improvement

in the manufacture of copying paper in oil colors, either with or without the addition of such chemicals which will render the marks produced by the copying paper indelible. He says:

"I first prepare a mixture of the following ingredients: "Boiled linseed oil, two parts; spirits of turpentine, one "part; copal varnish, one part. With this compound I "smear the paper thinly and evenly on one side, and al- "low it to soak and dry for about half an hour; then I "apply the coloring matter, which I prepare as follows: "For black, I take ivory black, four parts; pure black "lead, four parts; Prussian blue, one part."

He then gives sundry recipes in the patent for different colors, and says: "My copying paper is applicable to mak- "ing copies of letters, designs, or characters of any de- "sired description."

The next patent is that of Egerton, of 1877. He describes (p. 189) a composition of iodine, which is a vegetable coloring matter; indigo, which is another vegetable coloring matter; red and blue aniline, which is a mineral coloring matter; iron rust, which is a salt of the metal; brick dust, muriatic acid, and alcohol. The pigment thus described he mixes with the ordinary vehicle for making a printers' ink.

The next patent is that of John Hendrichs, of 1881, describing (p. 190) a lithographic ink in which copperas, bichromate of potash, and black union dye are used. He says: "'Black union dye,' as it is termed, is composed of "EXTRACT OF LOGWOOD dissolved in alcohol or HOT WATER, "or both. When put in a combination with COPPERAS "(which we have seen is SULPHATE OF IRON) it becomes a "deep, heavy black," &c., &c. He then describes that this pigment or dye is then ready to be ground with some ordinary printers' or lithographers' varnish for printing or lithographic purposes, as the case may be.

The next patent (p. 192) is that of the complainants, No. 348,072, to which we have already referred in the first part of this brief, and which describes in the terms of the

patent in suit and claims the composition of the patent in suit; wherefore, as we have endeavored to show, the patent in suit must be read as disclaiming that which is there claimed.

We now come to some English patents, all of which have a bearing upon the question here presented, but to the more important ones of which we will confine ourselves in this brief.

The patent of Frith, No. 2237, of the year 1798 (p. 195), describes a dye made of a decoction of *American oak or other wood in aquafortis or spirits of salts in connection with block tin;* showing therefore a pigment which is very similar to the dye matter of complainants' patent.

The next patent (p. 199) is that of Wedgwood, No. 2972, of 1806, for apparatus for producing duplicates of writings.

The specification of this patent says (p. 200): "I make "use of a prepared paper, which I call duplicate paper. "This is made by thinly smearing over any kind of thin "paper with any kind of oil, preferring those kinds of "oil which are least liable to oxygenizement, or to be "evaporated by heat. The ink made use of in this mode "of writing consists of carbon, *or any other coloring sub-* "*stance, and finely levigated in any kind of oil.* * * * "*This I call carbonated paper.* Or coloring matter of "any kind and in any other medium or vehicle may be "used, providing that medium be such as will admit of "the coloring matter being transferred to the duplicate "and writing paper; some coloring substances may like-"wise be used without any medium or vehicle."

He then describes the use of beeswax, and says (p. 201): "By this means, with a single pressure, a multiplicity of "impressions are formed at once."

Wedgwood, therefore, so far as the record informed us, is shown to be the father of carbon paper. His invention was to smear the paper with oil and pigment -"Any coloring matter"—"Any oil." The pigment of complainants' patent, as Frederick W. Underwood testifies (p. 134), was known at the time of the reign of Queen Eliza-

beth. Hence Wedgwood's specification was broad enough to cover this use of carbon paper, that is, the mixture of the precipitate of dye matter with the kinds of oil that are proper for producing a carbon paper. We submit, therefore, that in view of this showing, there was nothing for the complainants to invent in the making of the paper which is described in their patent of 1886, or in the paper which these defendants are making.

The next English patent is that of Kurtz, No. 11,544 of 1847 (p. 202). This describes a coloring matter made from extract of logwood in the presence of nitrate or nitrous acid, and says that this material is to be used as a dye. It then says: "*The coloring matter is used in printing by "dissolving or diffusing the mixture in a sufficient quan- "tity of water, according to the shade required, thicken- "ing the same with gum or the ordinary agents used by "printers for thickening the colors, adding, as in dyeing, "a sufficient quantity of hydrochloric acid or tartar of "commerce, or any other suitable supersalt;*" and the patent claims the manufacture of substantive coloring matter for dyeing or printing a bronze or brown color from aloes and extract of logwood by means of nitric or nitrous acid.

The patent of Swan, No. 342 of 1856 (p. 205), describes a black coloring matter applicable to the purpose of writing, staining or dyeing, and says that he employs *extract of logwood, treats it with bichromate of potash* which is an alkali; or with perchloride of mercury, which is a metallic salt; subcarbonate of potash, chlorate of potash and spirits of ammonia. He then says:

"And said coloring matter may be obtained in a "liquid form by introducing the salts above-men- "tioned into a liquid extract of logwood, and strain- "ing, or otherwise purifying, the liquid in any suit- "able manner, * * * and the solid coloring matter "may be kept on hand till required, and reduced to a "liquid form by dilution with any suitable proportion

**" of water." It then says: "The coloring fluid ob-
" tained in any of the modes hereinbefore set forth in
" the form of an ink may be converted into a copying
" fluid by the addition of any saccharine or other
" thickening ingredients hitherto employed."**

The next English patent is that of Underwood & Burt, No. 2206 of 1856 (p. 208), for a manufacture of ink for printing, and describes the making of an ink composed of nut galls, sulphate of iron, gum, soap, &c., &c. It says: " The above ingredients will form a black ink; but ink of " other colors may be made by using a soluble coloring " material or materials, such as sulphate of indigo or car- " mine, dissolved in ammonia."

It then describes an ink composed of nut galls and sulphate of iron.

The next English patent is that of Roberts & Dale, No. 1988 of 1857 (p. 212). It describes a pigment from dye wood, such as sandal wood and others, where the solution of wood is treated with a salt of tin, producing a precipitate, and it then says: " This precipitate is then fit for use " for printing on cloth, paper, or other substance." As to salt of tin, they say they might use persulphate of tin, " yet we do not confine ourselves thereto, for *other salts* " *of tin or of other metals*, the *per-sulphate of iron, for* " *instance*, may be used in lieu thereof." They say the resulting pigment may be used as a pigment for general purposes.

Next is the English patent of Dale & Caro (p. 216), No. 985 of 1860. It describes a dye composed of *logwood solution treated with metallic salts, such as salts of iron, alumina, tin or copper*: therefore showing the precipitate of complainants' patent.

We will now pass to patent of Schultz, No. 3021 of 1861 (p. 224), which describes a pigment prepared from a *decoction of logwood with caustic soda*, showing the same precipitate.

The next is English patent of Mayall (p. 225), No. 1392

of 1862, which also shows a pigment composed of logwood and ammonia of copper.

The next is English patent of Green (p. 226), No. 1354 of 1863, which speaks of coloring matter or pigment, and says in its preliminary specification: "The ingredients I " mostly use are *logwood, galls and tannin, the salts of* " *iron, copper, &c.*"

In the body of his specification he says his mode of proceeding results in a precipitate, and he then says: " I also " prepare these precipitates as water colors, in which case " they are only partially dried, or they may be mixed in " their damp state with size or other suitable vehicle, and " dried for use as crayons, or as solid ink in lieu of black " lead." He then says (p. 228): "*For some uses these* " *precipitates may be, when partially dried, mixed with the* " *oil, and then heated to drive off the remaining moisture.*"

He claims, thirdly, "the use of the before mentioned " pigments as water-colors, or dried as described herein as " crayons or solid ink."

This English patent of Green, therefore, shows the composition of complainants' patent, viz : the precipitate of dye matter produced from an admixture of extract of logwood with a metallic salt, ground in oil.

The next patent, that of Brooman, No. 1902 of 1863 (p. 231), describes a precipitate for dyeing produced by using *logwood* and *sulphate of copper.*

The last English patent, that of Henry, No. 2336 of 1864 (p. 235), speaks of a dyeing process in which *logwood, sulphate of iron,* with or without *sulphate of copper,* are used.

The above prior patents show that the *pigment* of complainants' patent was old in 1884. They show that the pigment of the complainants' patent had been mixed with oil. They show (and here we more particularly refer to the Wedgwood and Swan English patents and to the Cowan patent) that carbon papers, being papers covered with a mixture of oil and a *suitable* pigment, were old.

Under these circumstances no new invention is disclosed in complainants' patent.

Wood Paper Case, 23 Wallace, 566.
Tyler *vs.* Burton, 7 Wallace, 327.
Miller *vs.* Force, 116 U. S., 22.

For a further explanation of the sundry patents, we beg to refer to the testimony of the defendants' expert, Sloane, which will be found on pages 139 to 151, inclusive, of Record.

Finally, we call attention to the testimony of A. B. Fernald, on page 38, and that of S. T. Smith, on page 48. Fernald shows that in 1882 carbon paper was made by mixing lamp black and any kind of coloring matter with oil, lard, or with beeswax (Ans. 4, p. 38); and that amongst the coloring matters were lakes (Ans. 8); lakes being precipitates of dye matter (Ans. 9); while Stephen T. Smith testifies that for the last ten and twelve years carbon papers were made in this country by the use of sundry pigments ground in wax and lard oil (p. 49); that amongst the pigments there were lakes (Ans. 7), which are precipitates of dye matter (Ans. 8); and that such lakes were used in 1877; and that the witness showed Mr. John T. Underwood, six or seven years ago, typewriter ribbons saturated with oil and wax and a precipitate of a solution of logwood, and that Underwood understood that the logwood precipitate was in that typewriter ribbon (see Ans. 12 to 14, pp. 49 and 50). That the complainants used large quantities of logwood extract in 1881, 1882 and 1883, appears from the deposition of W. T. Allen (pp. 101 and 115 of Record).

We also in this connection refer to Dr. Drummond's stipulated testimony (p. 151) *to the effect that precipitate of dye matter and lakes were sold in this country for over ten years prior to* 1889 *as dry pigments, and also mixed with such oils as customers demanded.*

5th. The patent of complainants is void, because the patented article was placed in public use and on sale by complainants more than two years before application was made for the patent.

The defendants' answer on pages 7 and 8, charges that the invention or discovery claimed by the patent had been in public use and on sale in this country for more than two years prior to the application by complainants for Letters Patent, and had been abandoned to the public.

The application was filed on the 22d day of March, 1886. This is admitted in the complainants' bill of complaint (p. 2). The defense, therefore, is required to show the manufacture and sale of that which is patented to the the complainants in this suit, prior to the 22d day of March, 1884.

In support of this defense three witnesses testify, all of whom are interested in this litigation. One of them is Anton Andreas, the defendant. The others are John T. Underwood and Frederick W. Underwood, the complainants. All these witnesses were called by the defense. Mr. Andreas testifies that before going into business with Mr. Gerber, the other defendant, he was employed by John Underwood, *the father of the present complainants*, and that he was in Mr. John Underwood's employ from 1880 until 1887 (see p. 24); that during this time the pigments used in the preparation of carbon paper by John Underwood were precipitates mixed with lard, oil and wax (p. 25); and that the pigment used was a solution of extract of logwood (Ans. 16). All of which took place from 1880 to 1885 (see bottom p. 25), during which time the witness Andreas prepared carbon papers of this kind *at the rate of fifty sheets per hour* (Ans. 27, p. 26).

During cross-examination, the witness Andreas is asked to describe at length the process used by old Mr. Underwood from 1880 to 1885, and gives his answer in reply to

cross-questions 61 to 74 inclusive, pages 28 and 29. He is then asked this question:

" x-Q. 79. Have you been using that same kind of ma-
" terial and going through that same operation since you have been working with Mr. Gerber?

" A. Yes, sir."

See also his redirect-examination Q. 135–140, pages 32 and 33.

The witness *John T. Underwood*, one of the complainants, is then called and testifies, in answer 22, page 35, that a number of kinds of carbon paper were manufactured by John Underwood & Co. prior to the death of his father—the date of the death being June, 1881 (see Ans. 13, p. 35).

Mr. John T. Underwood's examination, which terminates on page 38, is next resumed on page 103. He there testifies (Ans. 58–60) that the invention relating to his patent was made in the *latter* part of 1884, namely, in October or November; that before October, 1884 (see p. 131), precipitates of dye matter had been only used experimentally by witness in the making of carbon paper, and that in 1883, he had mixed these precipitates experimentally with wax and oil (Ans. 65, page 104) and put these mixtures on paper in 1883 (Ans. 66). In answer to question 70, page 104, Mr. Underwood testifies that he had not sold before November, 1884, sheets of paper carrying a mixture of extract of dye wood with oleaginous matter. But in answer 75, page 105, he testifies as follows:

" Q. 75. I presume you criticise my question owing to my " failing to use the word 'precipitate'; and I therefore ask " you whether you did not, in the year 1883, sell carbon " paper or semi-carbon paper containing a precipitate of an " extract of dye wood mixed with oleaginous matter?

" A. We sold a substitute for carbon paper from time to " time to parties with a view of their testing the same, as in the " matter of carbon papers, there is no possible way of finding " out whether a thing is satisfactory without getting a very

"general opinion; that contained precipitate of dye matter, "and the difference between the precipitate of dye matter and "the extract of dye matter is very considerable, as they are "totally different in character.

"Q. 76. I understand you to testify that in the year 1883, "you did sell for the purpose of having the goods tested, car- "bon papers or substitutes for carbon paper which contained "the precipitate of extract of dye matter mixed with oleagi- "nous matter, am I right?

"A. YOU ARE.

"Q. 77. And that such carbon paper contained a mixture "of wax and oil?

"A. THEY DID.

* * * * * * * * *

"Q. 79. In preparing the paper in 1883 that you sold dur- "ing that year, did you take extract of dye wood, dissolve it "in water, and then form a precipitate by the addition of "some mineral salt of metal or alkali, or both?

"A. I DID."

In answer 88, page 106, he states that the precipitate which he used in 1883 was made from Brazil-wood and peach-wood in conjunction with various salts.

The Court will notice that Brazil-wood and peach-wood are both specified in complainants' patent.

In answer 93, page 106, he shows that one of the salts used by him at the time to produce the precipitate was *sulphate of copper.*

The third witness to establish this defense of public use before March, 1884, is the complainant *Frederick W. Underwood.* He testifies, after John T. Underwood's examination had been closed, and with a full knowledge of the damaging effect of John T. Underwood's testimony. This is what he brings forward (see Ans. 11, p. 127, Record):

"In 1883 we sold paper not exactly described as your "question asks for; we sold paper having dye wood "precipitates in, but in combination with certain deli- "quescent salts and chemical driers, as, theoretically

"speaking, it was possible to produce a reproducing paper "with deliquescent salts, to keep the paper damp, and "chemical driers, to keep the same from smutting; and in "1883 all papers were made with these deliquescent salts, "which salts acting most materially on the precipitate, "also on the oil and wax, did not produce a satisfactory "marketable article."

In answer 15 and 16, page 127, he refuses to name these deliquescent salts, and in answer 22 he admits that the salts, or some of those *mentioned in his patent*, are deliquescent salts before they are mixed with the precipitate.

On page 130, answer 29-32, this complainant admits that the patented composition with the addition of deliquescent salts was mixed by him with oleaginous matter in 1880 and sold in 1880. In answer 50, page 132, he admits that a few sheets *may have been put upon the market with the patented mixture without the deliquescent salts in the year* 1883. The witness admits, in answer 77, page 134, moreover, that the use of acids and of logwood extract for making a precipitate *was known in the sixteenth century, during the reign of Queen Elizabeth;* thereby showing that the precipitate of dye matter which the patent discloses was for nearly three hundred years a well known substance; while his brother, John T. Underwood (in answer 144, page 110,) admits that wax and oil have been used in the neighborhood of thirty odd years with lamp black or in conjunction *with any of the dry colors sold upon the market* in the making of carbon paper. One brother, therefore, admits that the pigment, to wit, the precipitate, which is a dry color, was commonly known for three hundred years, and the other brother admits that for over thirty years, to his knowledge, wax and oil have been mixed with any of the marketable pigments or dry colors and put on paper. Therefore, out of their own mouths, they seem to be convicted as patantees of that, which to their own knowledge was publicly used by every skilled manufacturer of carbon paper for at least thirty years,

and which was used by them, the complainants, personally for over two years before the application for their patent.

Frederick W. Underwood finally condescends to name the deliquescent salts which he used in 1883, and says, in answer 97, page 138, that some of them were nitrate of potash and nitrate of soda; and in answer 99 (same page) he says that he used these deliquescent salts *sometime before* the precipitate was mixed with the oil and some 81 times afterwards. On this point he is contradicted by his brother John, in his answer 212, page 122.

We believe the defense of prior public use has been fully established by this testimony.

Root *vs.* Third Avenue R. R. Co., 146 U. S., p. 210.
Smith & Griggs Mfg. Co. *vs.* Sprague, 123 U. S., 249.
Hall *vs.* Macneale, 107 U. S., 90-96.
Coffin *vs.* Ogden, 18 Wallace, 120.
Egbert *vs.* Lippman, 104 U. S., 333.
Consolidated Fruit Jar Co. *vs.* Wright, 94 U. S., 92.

In this connection it is, of course, proper to consider whether complainants' patent, if valid, would not be infringed, if defendants had used the patented combination with the addition of nitrate of soda or of carbon. There is no doubt in our minds that such an addition would not avoid the charge of infringement. By analogy of reasoning the same addition does not avoid the proof of prior public use.

Peters *vs* Active Manfg. Co., 21 Fed. Rep., 319.
Gorham *vs.* Mixter, 1 Amer. Law J., 539.
Foster *vs.* Moore, 1 Curtis, 279.
Lyman *vs.* Maypole, 19 Fed. Rep., 735 (and abstract following this opinion).
Consolidated Fruit Jar Co. *vs.* Wright, 94 U. S., 92, 94.

6th. The complainants' patent is void because of an intentionally misleading specification.

The answer contains this allegation (bottom page 6):

"These respondents further show unto your Honors on "information and belief, that, for the purpose of deceiv- "ing the public, the description and specification filed by "the complainants in the Patent Office of the United "States, in order to procure said Letters Patent, were "made to show less than the whole truth in regard to said "alleged invention or discovery."

This defense is based on the provisions in Section 4920 of the Revised Statutes. It is shown by the testimony of Mr. John T. Underwood that the Brazil-wood precipitated by sulphate of copper, which the witness had tried before making his application for patent, "did not give a satisfactory black by any means" (Answer 120, page 108); that "it was not satisfactory to our ideas," but that "further experiments *might lead to some use* by which it *would* prove of considerable use" (Answer 122, page 108).

The same witness testifies that the extract of peachwood, if treated with sulphate of copper and joined with oil and wax was not satisfactory (Answer 123, page 108). He is asked:

"Q. 124. Why not?

A. *The stuff did not act as it should; it wouldn't act, wouldn't adhere.*"

As to sapan-wood, the witness says that he never tried it; as to madder, that he never tried it; as to alizarine, that he never tried it (see page 109). The same witness testifies that an *alkali alone* in connection with extract of logwood *will not give a satisfactory result* (Answer 133, page 109).

He is then asked:

"Q. 134. Then why did you say, in your patent here in

suit, that you precipitate these dye matters with alkalies and mineral salts, or with alkalies, acids, and mineral salts, or with alkalies or acids alone?

"A. Because in our patent we did not limit ourselves to making a black carbon, and you asked me whether alkalies give a suitable black color."

He is then asked whether alkalies mixed with extract of dye-matter alone will produce, to his knowledge, a precipitate satisfactory for use, and answers (130, p. 109): "*I think not.*"

As to the oils, he says that his patent covers all oleaginous matter and glycerine (Answer 137, page 110); but (Ans. 138) that linseed oil, *if boiled, will not do.* He is asked:

"*What is there in the patent to tell us that linseed oil, boiled, would not do?*

"A. *I don't know that there is anything in the patent to* "*state that boiled linseed oil would not do. But the pat-*
"*ent does not state that linseed oil, boiled, would do.*"

As to the acids which the patent specifies, Frederick W. Underwood says *that acetic acid will not do* (see pages 133 and 134).

We have here, therefore, a patent which seeks to cover the use of *all* acids when the patentees knew that one of them would not do; the use of certain dye matters, as peachwood, Brazil-wood, &c., which the patentees knew would not do, or did not know they would; the use of *all* oils, when the patentees knew that boiled linseed oil would not do. Why did their patent not state that these acids, woods, and oils should not be included? John T. Underwood says (Ans. 122, p. 108) they were all included, because there was a hope that afterwards something might be discovered which would still leave the substances useful.

There was here, therefore, a designed concealment of facts, which was decided (in Whittemore *v.* Cutter, 1 Robb Patent Cases, p. 28; in Gray *v.* James, 1 Robb, p. 120; and

in Dyson *v.* Danforth, 4 Fisher, 133) must be held to invalidate the patent.

See also

Wood *v.* Underhill, 5 Howard, 1, 6.
Tyler *v.* Boston, 7 Wall., 327.
Lockwood *vs.* Faber, 27 F. R., 63.

7th. Infringement of the patent is not proven.

What have these defendants done to make them infringers of complainants' patent? They have sold a carbon paper which Professor Morton analyzed by dissolving what there was on the paper. For instance, he first applied ether to the defendants' paper, which dissolved out "all that is soluble in ether," meaning wax, oil, or any similar oleaginous substance (see p. 14, Record). The learned professor found from the other tests that the defendants' paper had *something* that was soluble in ether, and he assumes that that something must be some kind of an oil; what kind of an oil, however, he does not know. So, therefore, the defendants had a paper and *some* kind of an oil on the paper. If this oil was boiled linseed oil, then, according to John T. Underwood, it was *not* the oil of the patent (Ans. 137 and 138, p. 110). Further tests with the defendants' paper showed Professor Morton that it contained the coloring matter of logwood (see Ans. 7, p. 14). Further tests showed that it contained *copper* (see p. 15). Now *copper* is not *salt of copper*, but the metal. And on cross-examination (Ans. 32–34, pp. 22 and 23) Professor Morton shows that what he found *was copper, and not salt of copper.* He is asked:

"Q. 34. Then when you say, in answer to question 7, "that the tests applied to the ash of the papers are char-

"acteristic of the substance *copper*, you meant not cop-
"per, but *salt of copper ?*"

"A. No. What I meant was, that the tests were such
"as proved the presence of the element *copper* in the ma-
"terial tested, and I did not mean that these tests of them-
"selves decided whether the element existed in its me-
"tallic state, or in combination as a salt, or as several
"salts."

So that on this *prima facie* showing Professor Morton found the defendants' manufacture to consist of paper, something that is soluble in ether and copper; from which he concluded that it contained the thing which complainants' patent sought to protect. The cross-examination brought out that soda was present in the precipitate (see Answer 13, p. 19); but it does not appear whether that soda was added to the precipitate *after* the same had been formed or *before*—a point which, as we have shown, has been brought into prominence by the testimony of one of the complainants, F. W. Underwood (Ans. 99, p. 138)

It is important for the Court to understand that these defendants are charged with the infringement of the patent because they sell a carbon paper containing something soluble in ether—presumably an oil—containing the metal copper and containing also soda. Of course, if the soda was found as soda, it must have been added *after* the precipitate was formed; otherwise, as the authorities show, it would have disappeared as soda, and would have entered into combination chemically with the coloring matter of the dye-wood to become "the precipitate."

We submit, therefore, that infringement of the patent has not been shown, even if the patent is valid, inasmuch as it does not appear that a precipitate of dye matter *produced by the aid of an alkali, or by the aid of an acid, or by the aid of an alkali and mineral salt, or of an acid, alkali and mineral salt, had been used by the defendants.* A black powder was found containing copper and log-wood. Soda was also found. But to establish infringement it was necessary for the complainants to prove that

the soda was used by the defendants in *producing* and *creating* the precipitate. The burden of proof on the question of infringement being upon them, their failure to show that the soda was used to create the precipitate is tantamount to failure of proof of infringement.

Scott *vs.* Evans, 11 Fed. Rep., 726.

In other words:

Frederick W. Underwood seeks to satisfy the Court that the admixture of nitrate of soda to the precipitate after it was mixed with oil, or after the precipitate was formed, which admixture was carried on admittedly as early at least as 1883 by the complainants, and sold by them in that year, was an act which took, what they then sold, out of the scope of their later patent. In other words, the complainants' position is, that where you take their precipitate of dye matter and their oleaginous matter and add thereto a deliquescent salt, such as nitrate of soda or any other salt of the many names in the patent (because, as we have shown, they are all deliquescent), you depart by such addition materially from the scope of the patent. The defendants' paper was shown by analysis to carry a mixture of extract of logwood, of copper, and of soda. The soda is the deliquescent salt. When was it added by the defendants—before the precipitate was formed or afterwards? If added before, it would be, according to complainants' theory, within their patent. If added afterwards, it would, under the same theory, be, *aliunde*, the patent. Which was it? The answer denies infringement under oath. The burden of proof is upon the complainants. If the distinction to which we have referred is an essential distinction between infringement and non-infringement, between anticipation and non-anticipation of the patent, then certainly it was necessary for the complainants to show that the soda of the defendants' mixture was added before the precipitate was formed. In like manner it behooved the complainants to show that the oleaginous matter of defendants' paper was *not* boiled linseed oil, and that the copper on defendants' paper was a metallic *salt;*